the OIL AND GAS JOURNAL

Seasons Greetings

Byron Jackson Co... Oil Tool... Pump... Electronic Divisions

B. J. Service, Inc. • Byron Jackson of Canada Limited • Byron Jackson Co. S.A.

PRICE 50 CENTS TABLE OF CONTENTS ON PAGE 1 **DECEMBER 20, 1954**

Most sincere wishes that yours is a very Merry Christmas . . . and that you enjoy good health and happiness during '55 and the years to come.

THE CONTINENTAL SUPPLY COMPANY

the OIL AND GAS JOURNAL

DECEMBER 20, 1954 VOL. 53 NO. 33

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In Brief . . .

1. UPGRADING DISTILLATES . . . In catalytic desulfurization, organic sulfur compounds are converted to hydrogen sulfide and saturated hydrocarbons. The process is a mild, selective hydrogenation with maximum desulfurization and minimum competing reactions. In general, the lighter the fraction, the simpler the desulfurization.

2. INCREASED ACTIVITY . . . Seriously planned drilling activities are only now getting under way in the Raton basin area. Total of all drilling in the area so far has neither proved nor disproved the merits of the region. Much serious work remains to be done and probably numerous test wells must be drilled before possibilities are evaluated.

3. SUCCESSFUL FLOOD . . . Since the start of water flooding in West Burkburnett field of North Texas, daily oil production in most of the wells has increased severalfold. Magnolia's production increased from 250 bbl. daily in 1942 to 7,000 in August 1953, and present average production is still in excess of 5,000 bbl. per day.

4. PIPELINE FAILURE . . . Pipeline ruptures occurred recently on a trunk line and gathering lines of El Paso Natural Gas Co. in West Texas. Intensive study indicated conclusively that hydrogen blistering—with the necessary atomic hydrogen being supplied from internal corrosion—was the cause of the failures. Organic-inhibitor injection stopped the corrosion and in turn ended hydrogen blistering and pipeline failure. This is the first known occurrence of hydrogen blistering on a gas-transmission line.

5. AUTOMATIC VALVES . . . Use of power-operated conventional flow valves permits automation of all types of production leases handling all sorts of crude oils. Construction of lubricating plug valves insures positive shutoff even in use with oils having considerable sand content or other abrasive materials in suspension. On low-pressure applications, gate valves are often preferred and used. Power actuators have been developed for these valves to permit their use in automatically controlled lease installations.

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B.F.Goodrich hose more flexible, extra strong for deep drilling

HERE's a hose that has all the strength it takes to handle extreme bottom hole pressures, yet is still the most flexible one made for heavy-duty service. It's B. F. Goodrich Highflex rotary drilling hose.

Spiral-wrapped cable wires make it resistant to bursts, qualify it for Grade C (5000 lb. test pressure) American Petroleum Institute. Hose ends are reinforced with additional plies of wire and fabric to protect against bending stress at the couplings. This extra strength means no hose blowouts—added safety for your crew and rig.

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This longer-lasting hose is available at leading supply stores. And here's something to keep in mind. When emergencies make service the *first* consideration in buying hose, you can get the replacement you need any time day or night at one of these B. F. Goodrich warehouses: Los Angeles, Great Bend, New Orleans, Hobbs, Williston, Oklahoma City, Tulsa, Dallas, Houston, Odessa, Wichita Falls. *The B. F. Goodrich Company, Dept. M-353, Akron 18, Ohio.*

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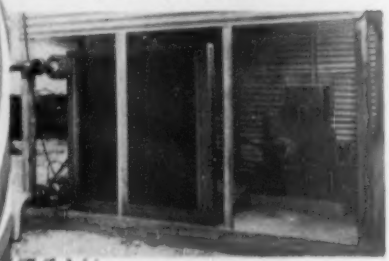

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187

Bottom Outlet Type

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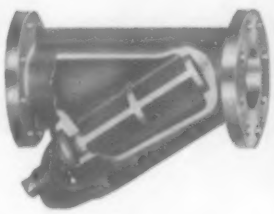
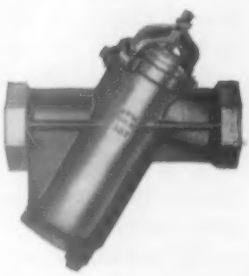


No. 187-F

Bottom opening type. Heavy cast iron body, 125 pound. Furnished with 40 mesh bronze cage, reinforced screen for gasoline, 14 mesh brass screen for fuel oil.



No. 387

Top outlet type. 125 pound. Heavy ribbed iron body has tapped plug in top section for air relief connection, also bottom drain plug. Both drilled for seal wires.

No. 487-F

Top outlet type 200 pound flanged, drilled and faced on pipe ends with bolted, gasketed cap.

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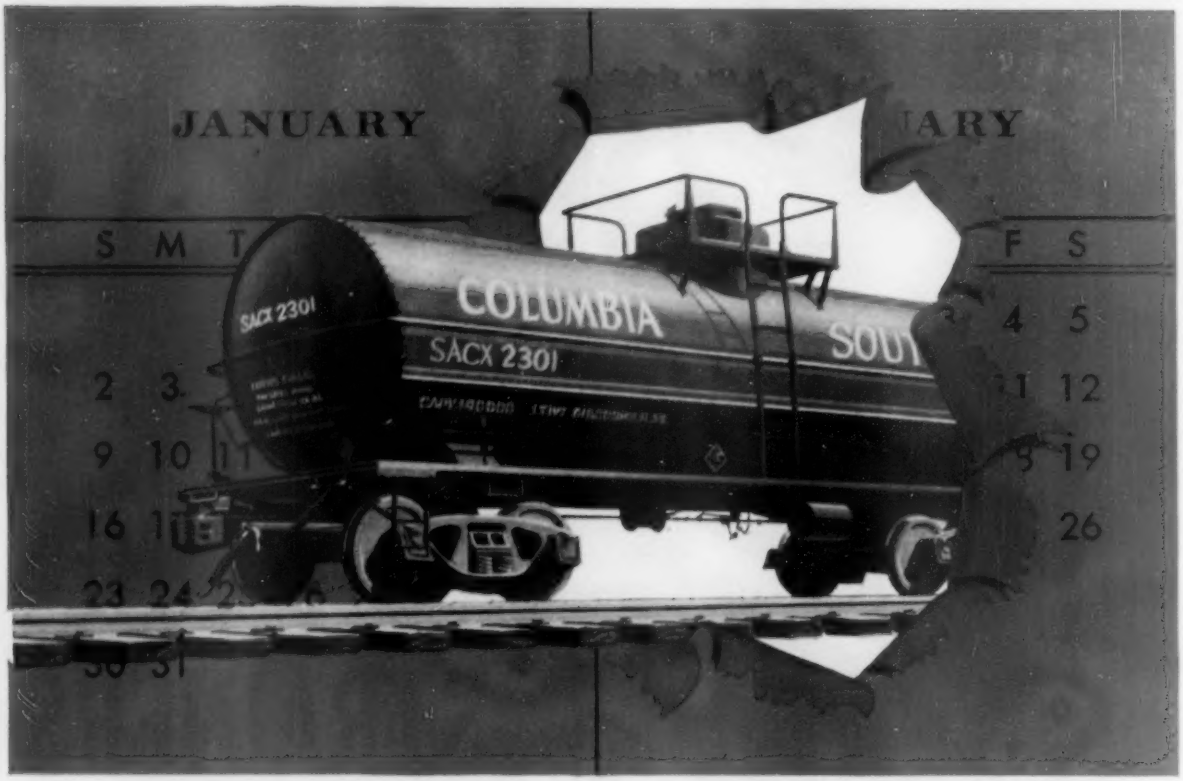

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Several customers who recently changed from 50% to 73% caustic soda said they would have converted sooner but they didn't think the *savings story* applied to their operations.

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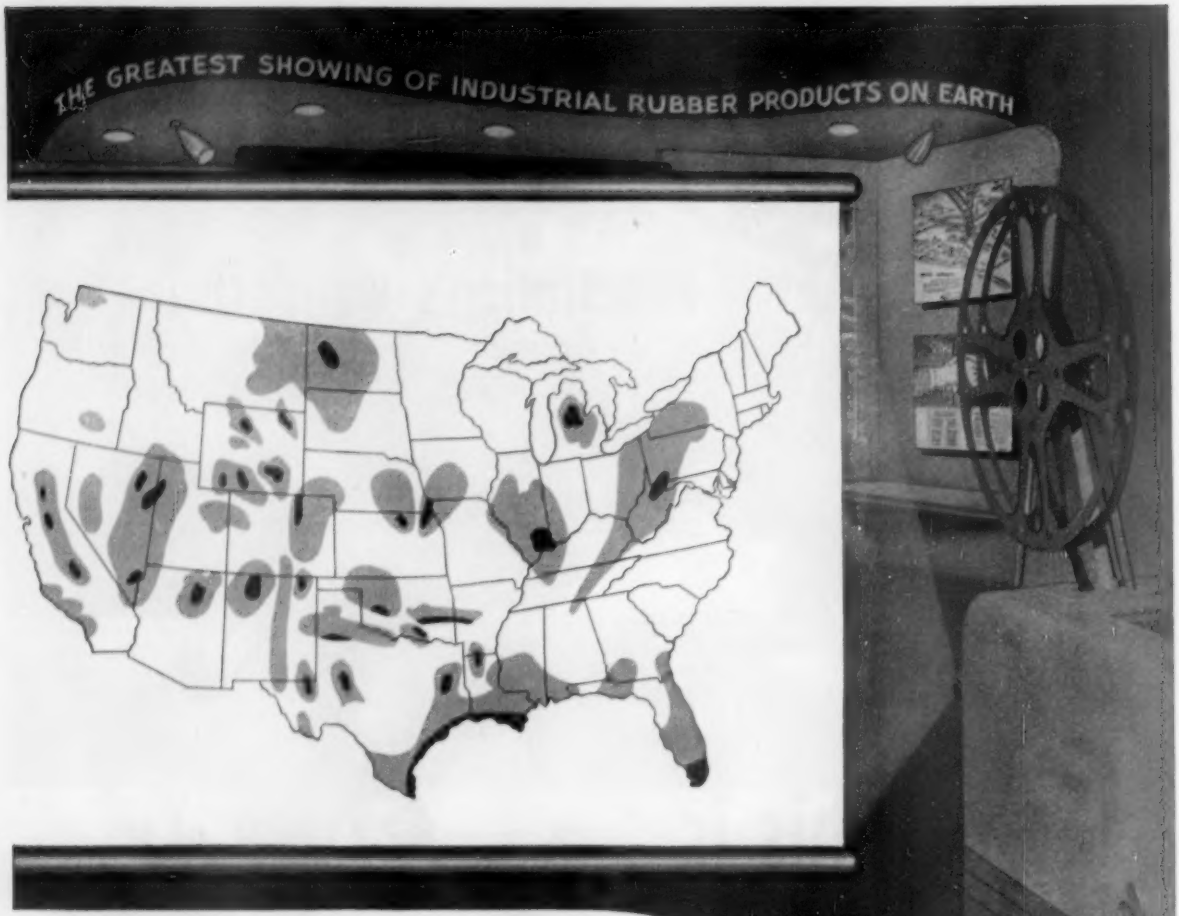

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We take pride in the fact that Republic Rubber Products are stocked in every major oil field in the United States by outstanding Distributors serving the Oil Industry.

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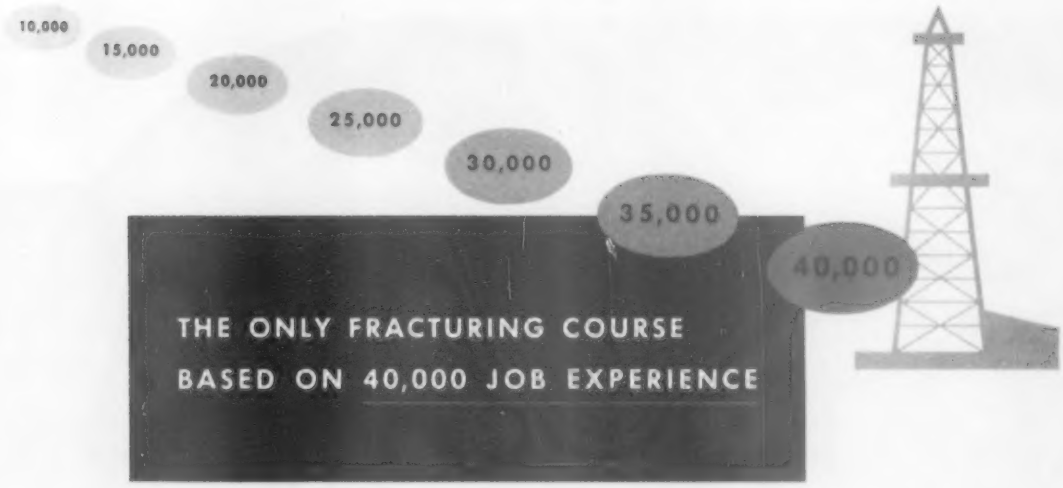

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The experience of 40,000 Halliburton fracturing jobs completed since March, 1949, has provided the world's most intensive, most complete course in successful fracturing. From the lessons of this five-year course, the Halliburton operator in your area has the practical field know-how to help boost the production of your well.

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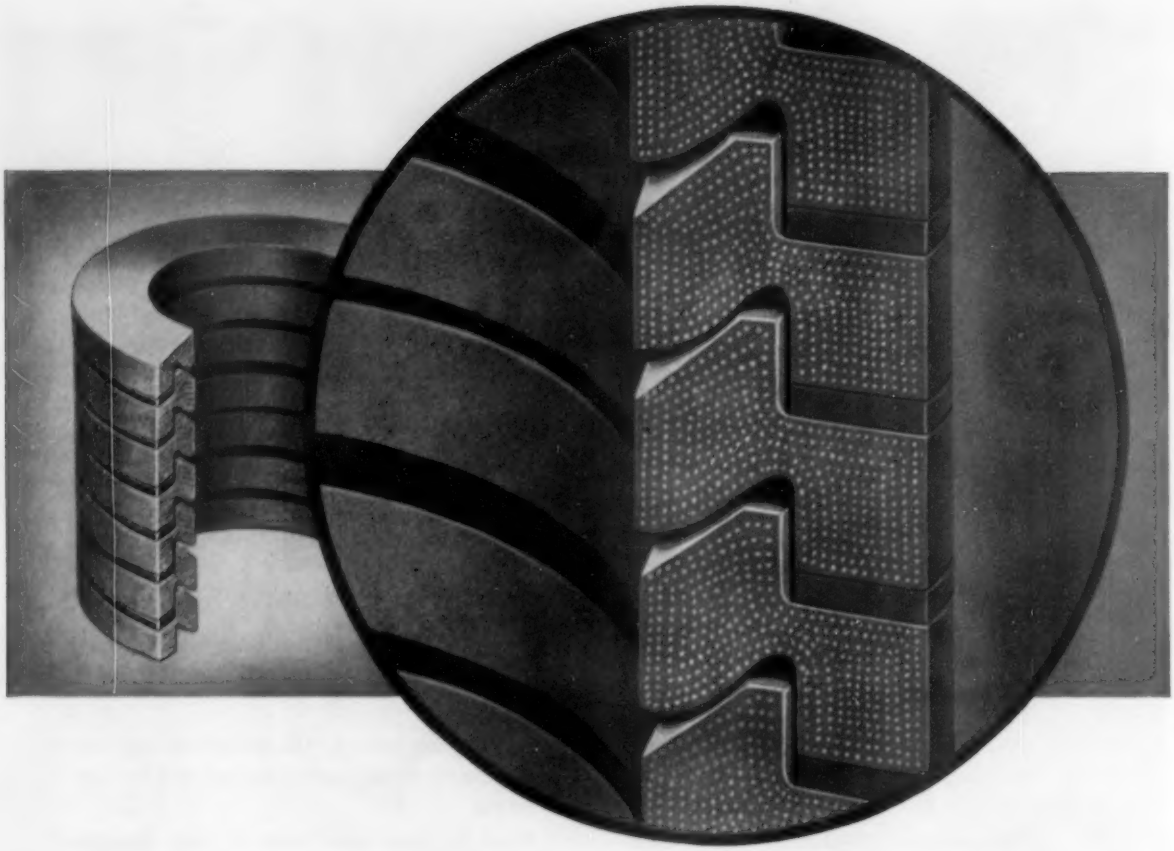
FRACTURING SERVICES

211 SERVICE CAMPS — JUST MINUTES AWAY FROM ANY RIG



R/M "Vee-Square" mud pump packings need no sensitive gland adjustments

For heavy-duty service in the oil fields, you won't find better packings than R/M "Vee-Square"® Rings. They seal efficiently; are easier on rods; and, unlike ordinary V-ring packings, do not require sensitive, finger-tip adjustment.

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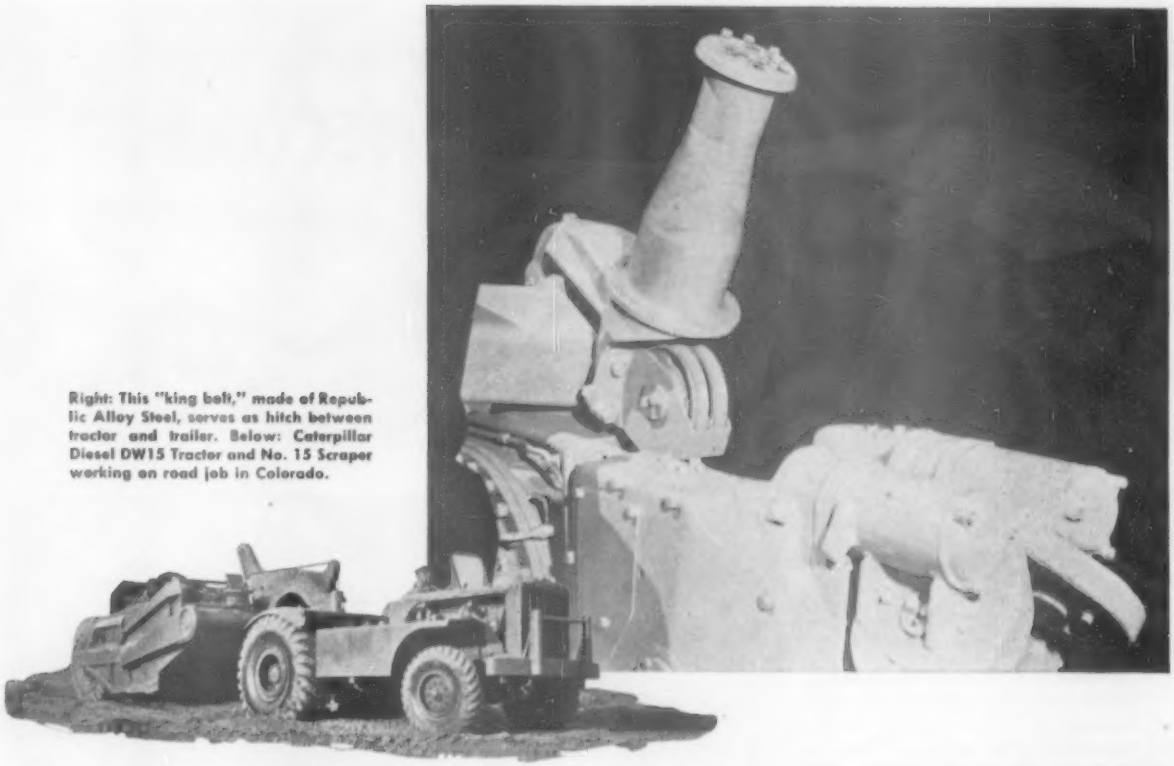

Right: This "king bolt," made of Republic Alloy Steel, serves as hitch between tractor and trailer. Below: Caterpillar Diesel DW15 Tractor and No. 15 Scraper working on road job in Colorado.

How Republic Alloy Steels Help CATERPILLAR®

Take the "king bolt." It's the link between tractor and scraper or wagon. It takes all the pull, the bumps, and the shocks when a tractor drags earth-moving or other heavy equipment over uneven ground. It has to be tough.

Caterpillar uses a specific Republic Alloy Steel for this part on its DW15 tractor. And for other parts as well, many of which are not as easy to spot. But all of which are important.

Republic has been supplying Caterpillar with alloy steels for a good portion of the 50 years that track-type machines have been roaming and moving the earth. More than this, Republic metallurgists have helped Caterpillar use these steels to best advantage.

This year is Caterpillar's 50th Anniversary in the manufacture of crawler tractors. And Republic is glad to congratulate a pioneer. You see, Republic pioneered the wide use of alloy steels. And we're still helping manufacturers use these steels profitably.

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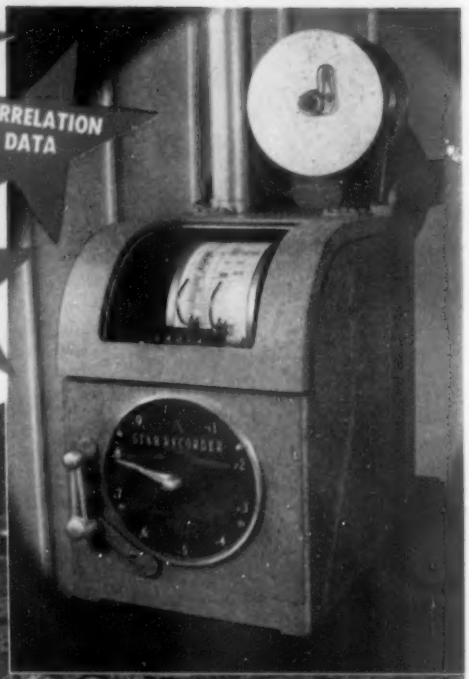

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Controls. *Complete control systems utilizing the new Solar "Microjet"® principle for control of gas turbines, jet engines and pneumatic devices.*

FURTHER INFORMATION
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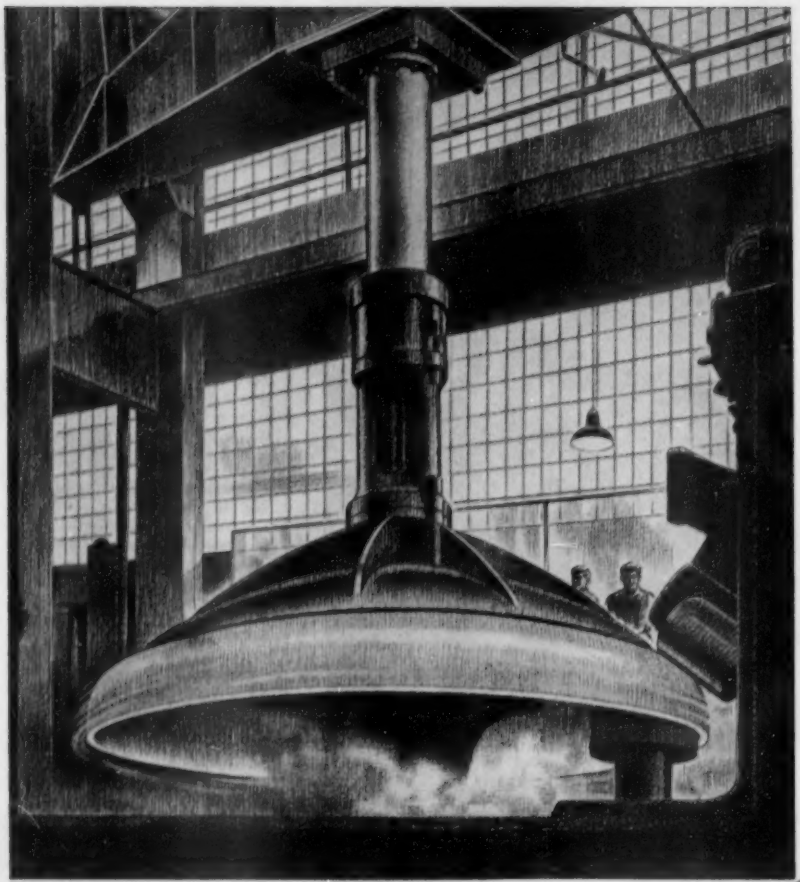
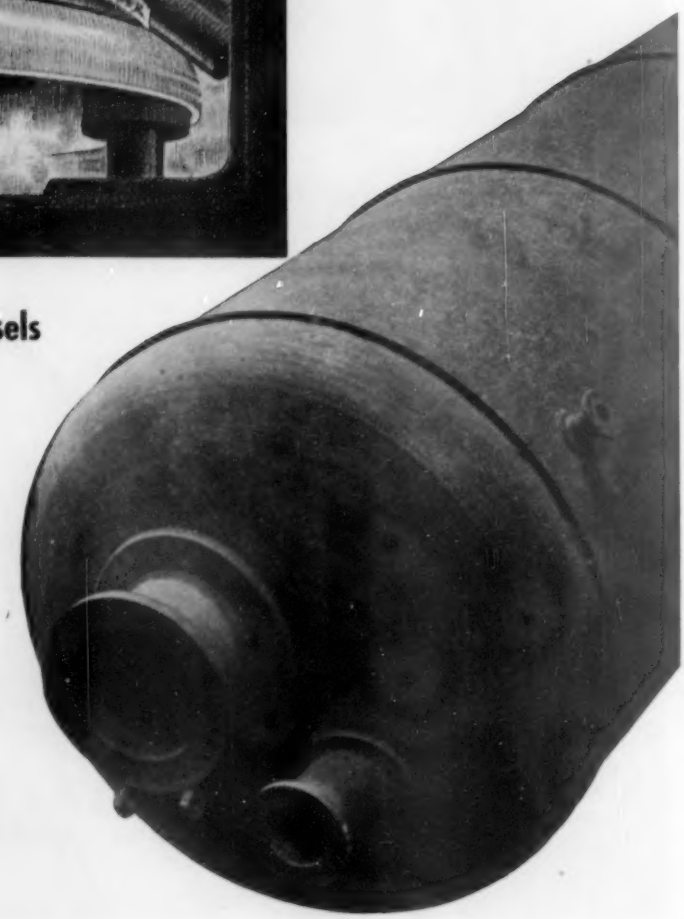
Spinning



SAVES METAL

—CUTS TOOL COSTS

The design and production of Pressure Vessels may be greatly facilitated by using dished and flanged ends spun by Harveys on the Rotarpress. They combine semi-ellipsoidal form with large knuckle radius. A substantial reduction in plate thickness can be effected, and in most cases tool costs are eliminated.



'Rotarprest' Ends for Pressure Vessels

can be supplied in Mild, Alloy and Clad Steels and Non-Ferrous Metals. The capacity of the Rotarpress ranges from 5 to 15 feet diameter, and 3/16" to 4" thickness. Knuckle radii and depth may be varied to meet individual requirements.

Please ask for List No. OG-881 giving full range of sizes.

Harvey

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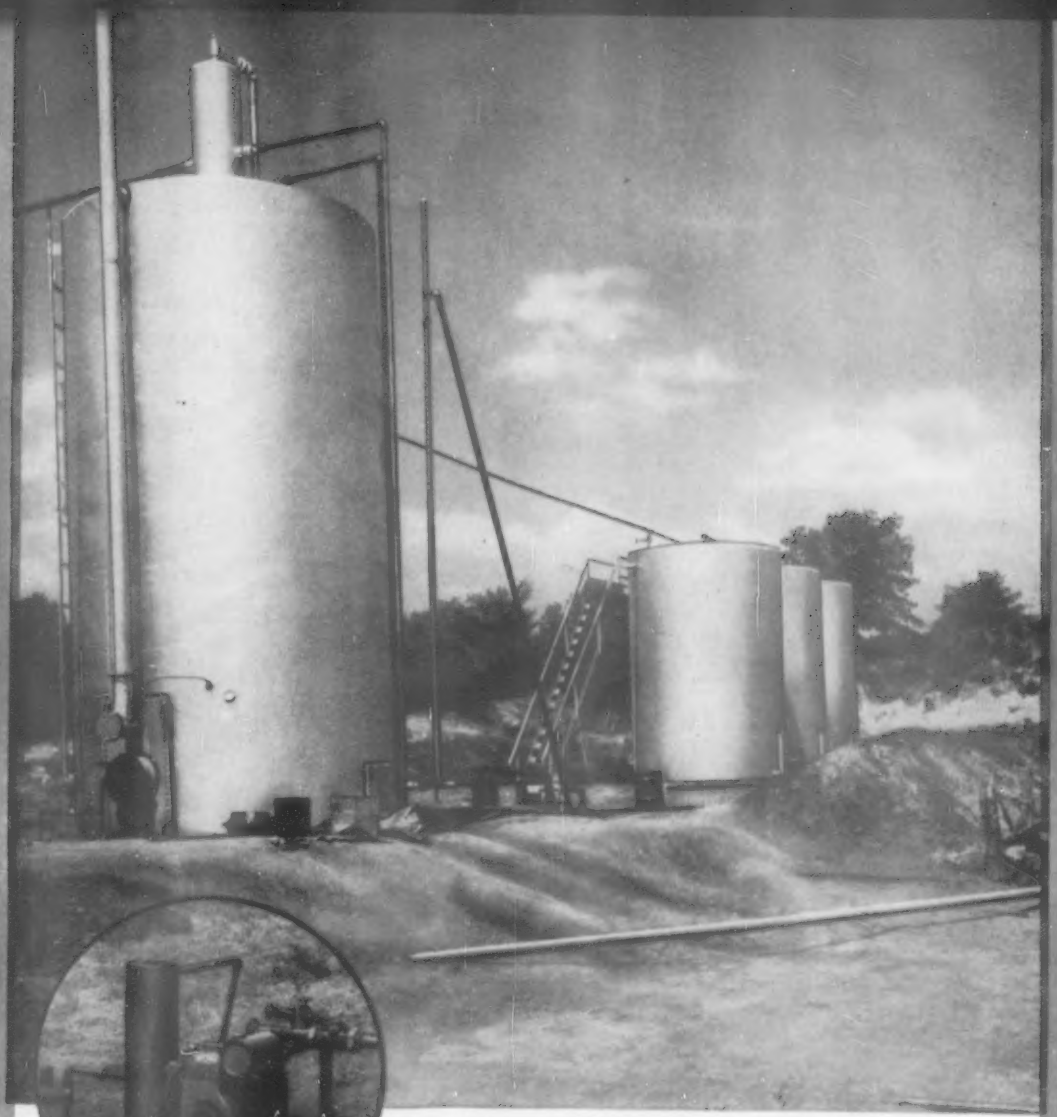

Additional profits for operators everywhere are realized by recovering good, useable oil from basic sediment and water. Pumping from storage tank bottoms to heater treaters to save the oil normally burned each year in slush pits, is one of many jobs Marlow Self-Priming Centrifugal Pumps do quickly and efficiently throughout the oil country.

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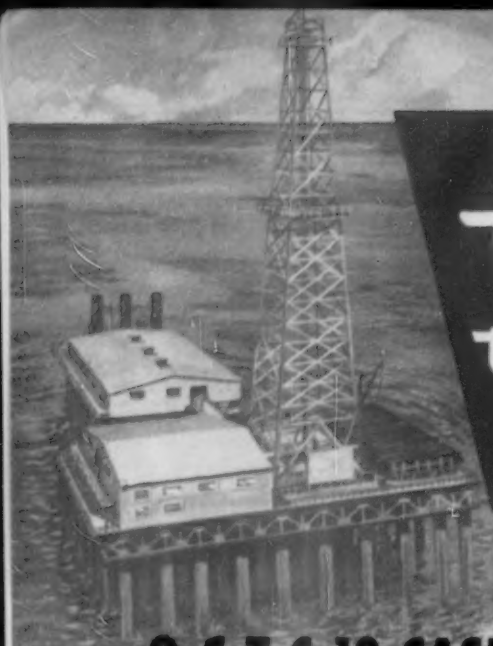
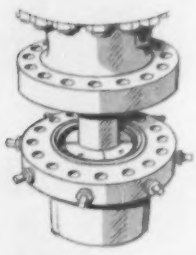
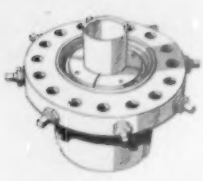
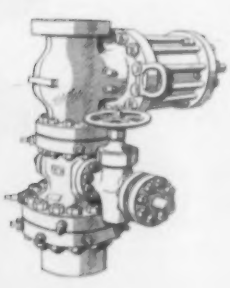


This is no place to take chances



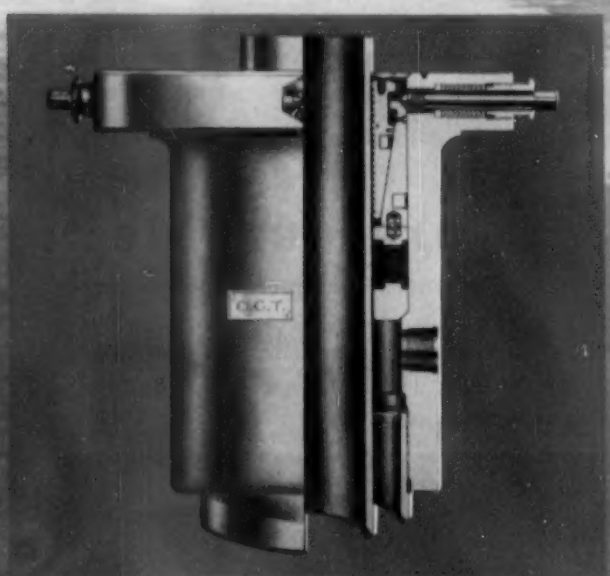




O-C-T C-19 CASING HEADS

give you greater safety and dependability than any other hanger you can buy--

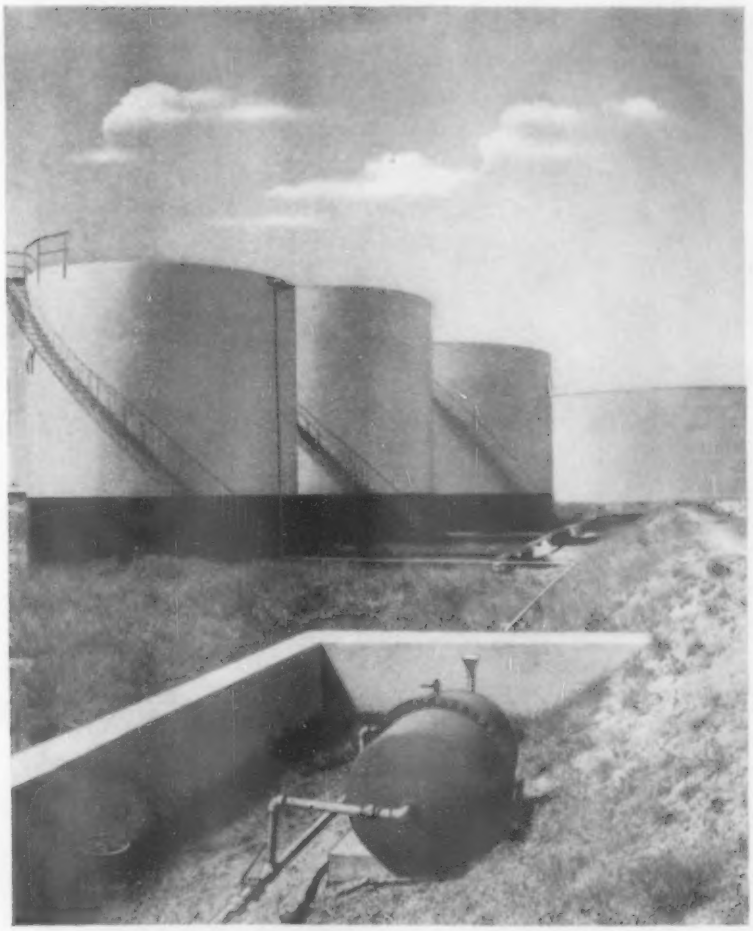
Miles out in the Gulf is no place to risk a blowout around casing. O-C-T "C-19" Casing Heads eliminate this risk by providing a positive casing seal and suspension before blowout preventers are removed. When dropped through preventers, suspension and seal are automatically effected. In addition, slip hanger load capacity is in excess of 600,000 lbs. It automatically suspends and seals. Hazardous installation work is cut to a minimum. Hours of valuable rig time are saved. You can depend on O-C-T "C-19" Casing Heads for greater safety and economy. The "C-19" is the only automatic self-sealing suspension unit that has been proved by performance on the world's longest strings of casing. You take no chances with O-C-T. Ask your O-C-T representative for details.



O·C·T

OIL CENTER TOOL CO.

Export Representatives: Sterling Areas — Le Grand, Sutcliff & Gell, Ltd., Rochester, Kent, England. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.



Shown in foreground is operating unit of Rockwood SpotPROTECTION System protecting oil storage at SOUTHWEST OIL REFINERY.

New Way to Protect a Danger Spot

The tank in the foreground is compact but powerful in action. It can stop a fire that could destroy a fortune.

Rockwood now offers you a *compact*, moderately priced, yet *complete* unit, expertly engineered to snuff out fires instantly. Rockwood's storage and automatic proportioning system, an exclusive patented feature, make this compact unit an eveready watchdog to protect your property, lives and continuing business.

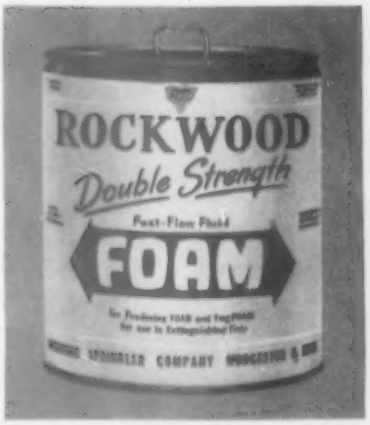
Here's how it works. The tank contains Rockwood FOAM liquid which, in an emergency, is automatically proportioned into the water. This mixture is then discharged from jet-action Rockwood's Double Barrelled FOAM Maker Chamber onto the surface of the burning oil — forming a fast flowing blanket of FOAM. This blanket covers the fire and strangles it.

Danger "spots" can result in loss of lives, money and property. Save these with SpotPROTECTION from this new compact, moderately priced unit. Is there a danger "spot" on your premises? Don't leave it unprotected. Find out how Rockwood can engineer water to cut fire losses for you.

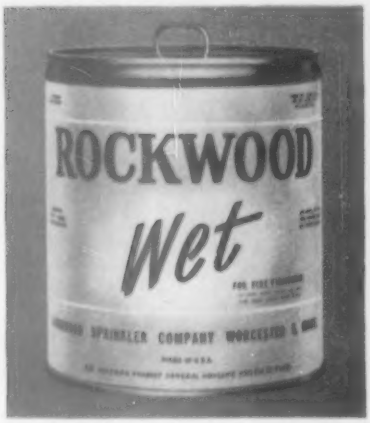
ROCKWOOD SPRINKLER COMPANY

Engineers Water . . . to Cut Fire Losses

How Rockwood Engineers Water to Cut Fire Losses



Rockwood Double Strength Foam clings to metal surfaces as an insulator, flows freely at sub-zero temperatures. Excellent for extinguishing fires in gasoline, benzol and other highly volatile liquids as well as ordinary combustibles.



Rockwood Wet makes water go farther. One part of Wet mixed with 99 parts water, increases penetration and extinguishing action of water. A "must" for deep seated fires and where water is scarce. Helps reduce amount of time and manpower.

SEND FOR THIS INFORMATIVE BOOKLET

ROCKWOOD SPRINKLER COMPANY
Portable Fire Protection Division
372 Harlow Street
Worcester 5, Mass.

Please send me your illustrated booklet on Rockwood fire-fighting products.

Name _____

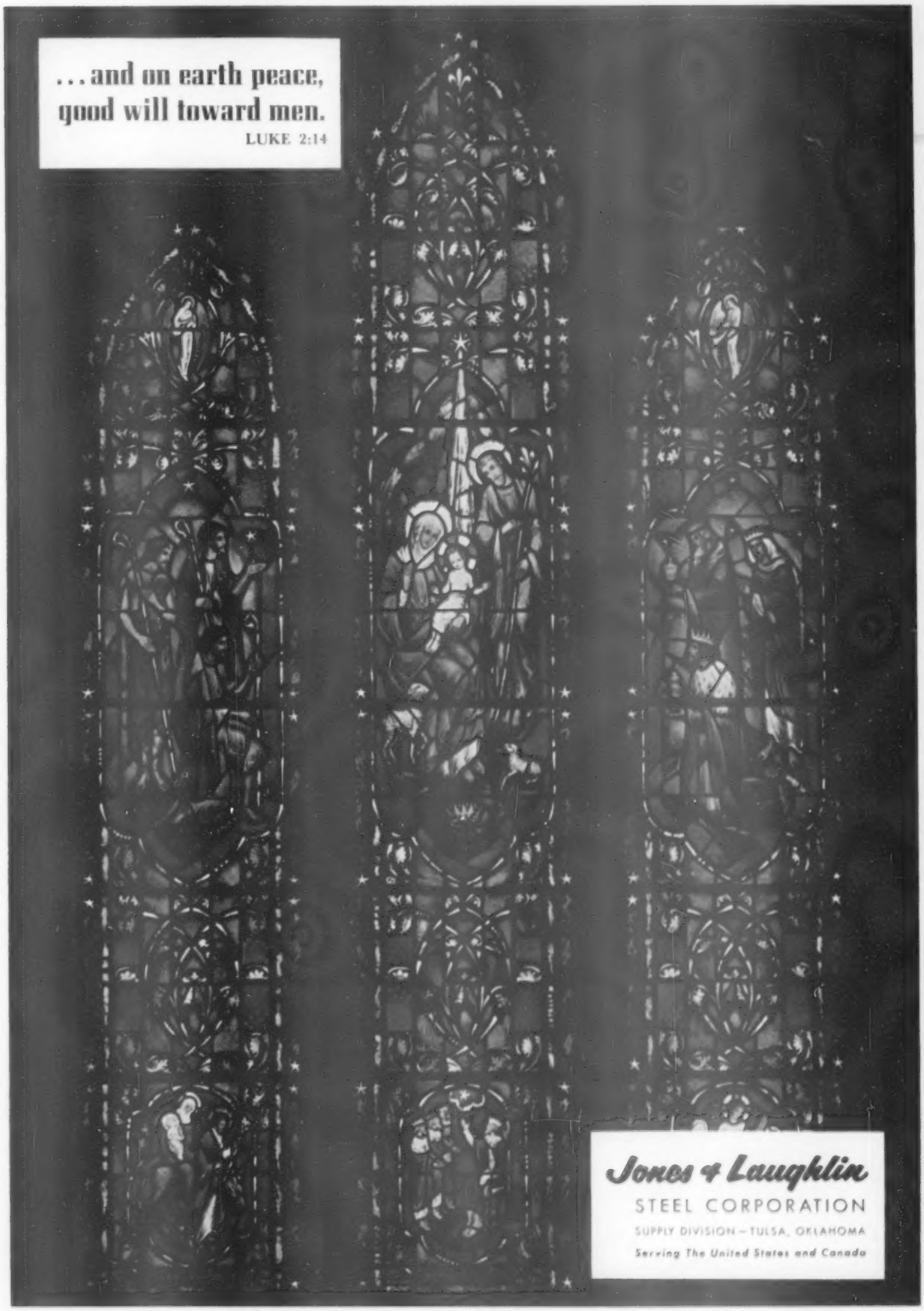
Title _____

Company _____

Street _____ City _____

Zone _____ State _____

Numerous indeed are those to whom Christmas brings a brief season of happiness and enjoyment. How many old recollections and how many fond memories we have of our daily business life through the year. We deem it a privilege and pleasure to pause at this time and express not only our thanks to our many friends, but also the thoughts that are ours as we humbly say
"Peace on Earth, Goodwill Toward Man."
Mrs. Laura B. Sillers
President
PEERLESS MANUFACTURING COMPANY
Walnut Hill Lane and Old Denton Road
Dallas, Texas


. . . and on earth peace,
good will toward men.
LUKE 2:14
Jones & Laughlin
STEEL CORPORATION
SUPPLY DIVISION – TULSA, OKLAHOMA
Serving The United States and Canada

Window in Second Congregational Church, Holyoke, Massachusetts, by Charles J. Connick Associates, Boston

Flying Comfort

in the new AERO COMMANDER 560

FLYING COMFORT . . .

Greater inherent stability through high wing design is but one of the factors responsible for increased flying comfort in the new Aero Commander 560.

A clear view of the countryside is enjoyed from individual by-the-window seats in this 5-7 place twin-engine executive airplane.

WRITE DEPT. 120 FOR NEW CATALOGUE

AERO DESIGN Commander 560

AERO DESIGN AND ENGINEERING COMPANY • TULAKES AIRPORT • P. O. BOX 118 • BETHANY, OKLAHOMA

CHEMICO is awarded its 1,000th job...

...in its 40th year

Significant is the fact that CHEMICO's 1,000th project is a repeat order . . . the *third* order from the same client.

This project is a contact sulfuric acid plant for a Brazilian company which placed its first order with CHEMICO eighteen years ago.

Repeat orders mean satisfied customers . . . and the list of CHEMICO's 1,000 projects includes an impressive volume of such business. Whatever may be your needs for the manufacture of heavy chemicals, be sure to consult CHEMICO.

CHEMICAL CONSTRUCTION CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

488 MADISON AVENUE, NEW YORK 22, N. Y.

CABLES: CHEMICONST, NEW YORK

TECHNICAL REPRESENTATIVES: CYANAMID PRODUCTS LTD., LONDON • CHEMICAL CONSTRUCTION (INTER-AMERICAN) LTD., TORONTO • SOUTH AFRICAN CYANAMID (PTY) LTD., JOHANNESBURG

CC276

CHEMICO

CHEMICO CHEMICAL CONSTRUCTION CORPORATION

Speeding more gas to the nation

To HELP MEET the nation's growing demand for natural gas, hundreds of new gathering lines are being installed to feed the huge transmission lines.

To help keep these construction jobs on schedule, purchasers of line pipe are relying more and more on the prompt delivery of Basalt-Kaiser line pipe.

This dependable delivery—plus *uniform quality, wide range of sizes* and *experienced technical and metallurgical* service—is another reason why pipeline companies are careful to specify Kaiser Steel.

Kaiser Steel

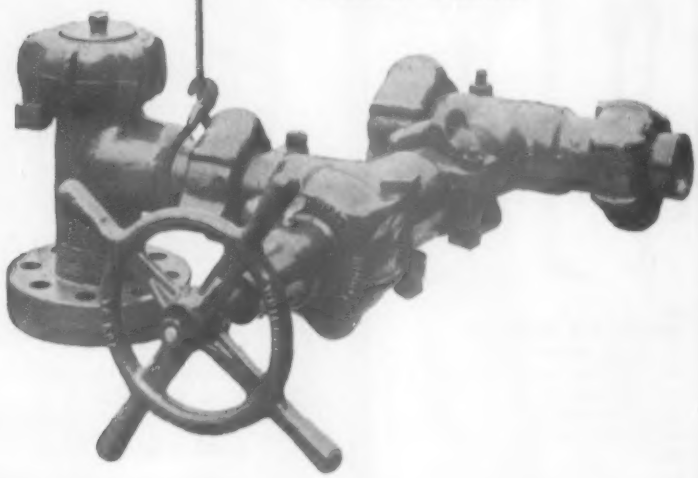
KAISER STEEL PIPE SPECIFICATIONS • All pipe manufactured to latest A.S.T.M. and A.P.I. specifications

Type	Diameter	Length	Wall Thickness	Shipping Point
Continuous Weld—Threaded and Coupled	½" to 4" nominal I.D.	Uniform 21'	Standard	Fontana, Calif.
Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance and Fusion Weld—Plain End	14" to 18" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5⅛" to 12¾" O.D.	Up to 55'	.188" to .375"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	20" to 30" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser

Prompt, dependable delivery at competitive prices • KAISER STEEL CORPORATION Los Angeles, Oakland, Seattle, Portland, Denver, Tulsa, New York

UNIBOLT FLOW MANIFOLDS

started a new trend — the fabrication of salvageable parts into a compact, strong, lightweight unit that provides everything necessary above the master valve



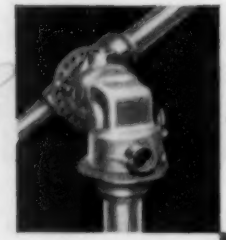
More and more operators are requesting their Christmas tree supplier to furnish UNIBOLT Flow Manifolds because they are lighter in weight, stronger, and more economical, and easier to maintain than ordinary flanged Christmas tree wings.

Employing standard UNIBOLT connections rather than flanges, the UNIBOLT Flow Manifold is many pounds lighter, yet the UNIBOLT design, which places more steel in shear, actually results in a higher factor of safety for the manifold.

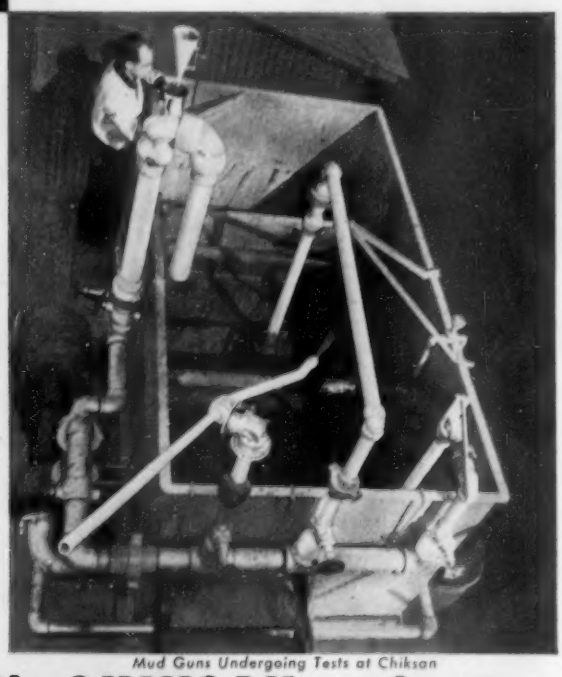
The units of the manifold — UNIBOLT Tee or Cross, Adjustable Wing Valve, and Positive Choke Body — are pressure-tested as a unit and may be assembled in a number of combinations to best meet individual needs. They are furnished in regular forged steel or in stainless steel for corrosive wells — 6,000, 10,000 and 15,000 lbs. test. The manifold is completely salvageable.

THORNHILL CRAVER CO.

P. O. BOX 1184 HOUSTON, TEXAS



here's to no "mud in your eye"



Mud Guns Undergoing Tests at Chiksan

with *CHIKSAN* mud guns...

a:
NON-SPIN MUD MIXING GUN
The Chiksan Non-Spin Mud Gun illustrated above can't spin because centrifugal force is neutralized by the offset in the barrel of the gun. Perforated flanges and locking pins permit locking the gun in any desired position.

b:
BOTTOM TYPE MUD MIXING GUN
The Chiksan Bottom Type Mud Gun is designed for use where large size metal tanks are employed as mud pits. It is simple in construction; easy to install, and easy to operate.

c:
SPINNER TYPE MUD MIXING GUN
The Chiksan Spinner Type Mud Gun is designed for use in tanks where the utmost in constant agitation is desired. The nozzles are set at an angle and the pressure in the line imparts a spinning motion which is accommodated by a style No. 20 Chiksan High Pressure Swivel Joint. Furnished in any desired length as specified on order.

Chiksan Mud Guns provide complete safety, flexibility and economy in the drilling operation of the oil industry.

The heart of the guns is the Chiksan Ball-Bearing Swivel Joint, made of tough, hardened steel for long life and trouble-free maintenance.

These Chiksan Mud Guns come in three distinct types illustrated in the left hand panel. They are the standard of the drilling industry, proved by years of economical operation.

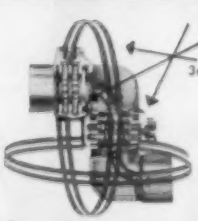
WRITE FOR CHIKSAN CATALOG, DEPT. 12-OGJ

The Flow of Enterprise Relies on

CHIKSAN

Ball-Bearing Swivel Joints

THE NEW TOOL OF MODERN INDUSTRY

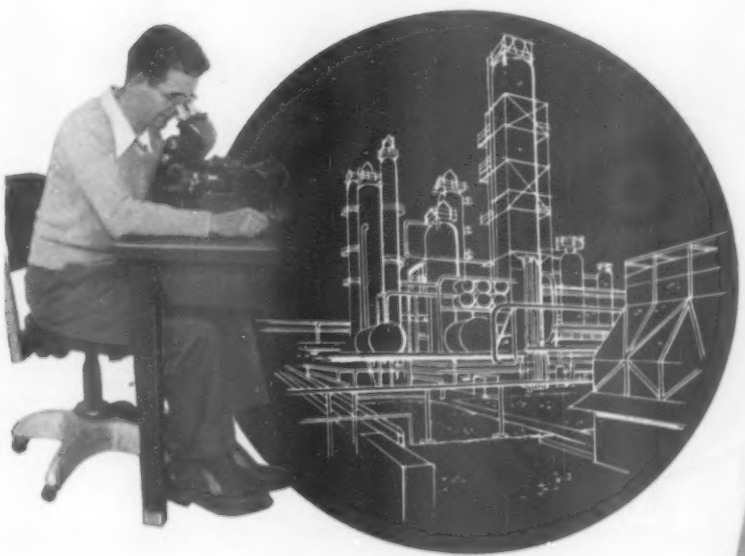


CHIKSAN Ball Bearing Swivel Joints are THE NEW TOOL of Modern Industry with full 360° rotation in 1, 2, and 3 planes. Over 1,000 different types, styles, and sizes have been developed for pressures and services from 28" vacuum to 15,000 psi and for temperature ranges from minus 70° to a plus 500° F. with packing materials for each specific service.

CHIKSAN COMPANY • BREA, CALIFORNIA • Chicago 3, Illinois • Newark 2, New Jersey

Well Equipment Mfg. Corp. (Division), Houston 1, Texas • Subsidiaries: Chiksan Export Co., Brea, Calif., Newark 2, N.J. • Chiksan of Canada Ltd., Edmonton, Alta.

is corrosion costing you too much?



our job at Globe is to keep this costly problem at a minimum — through the use of GLOBE Steel Tubes, produced for your specific requirements!

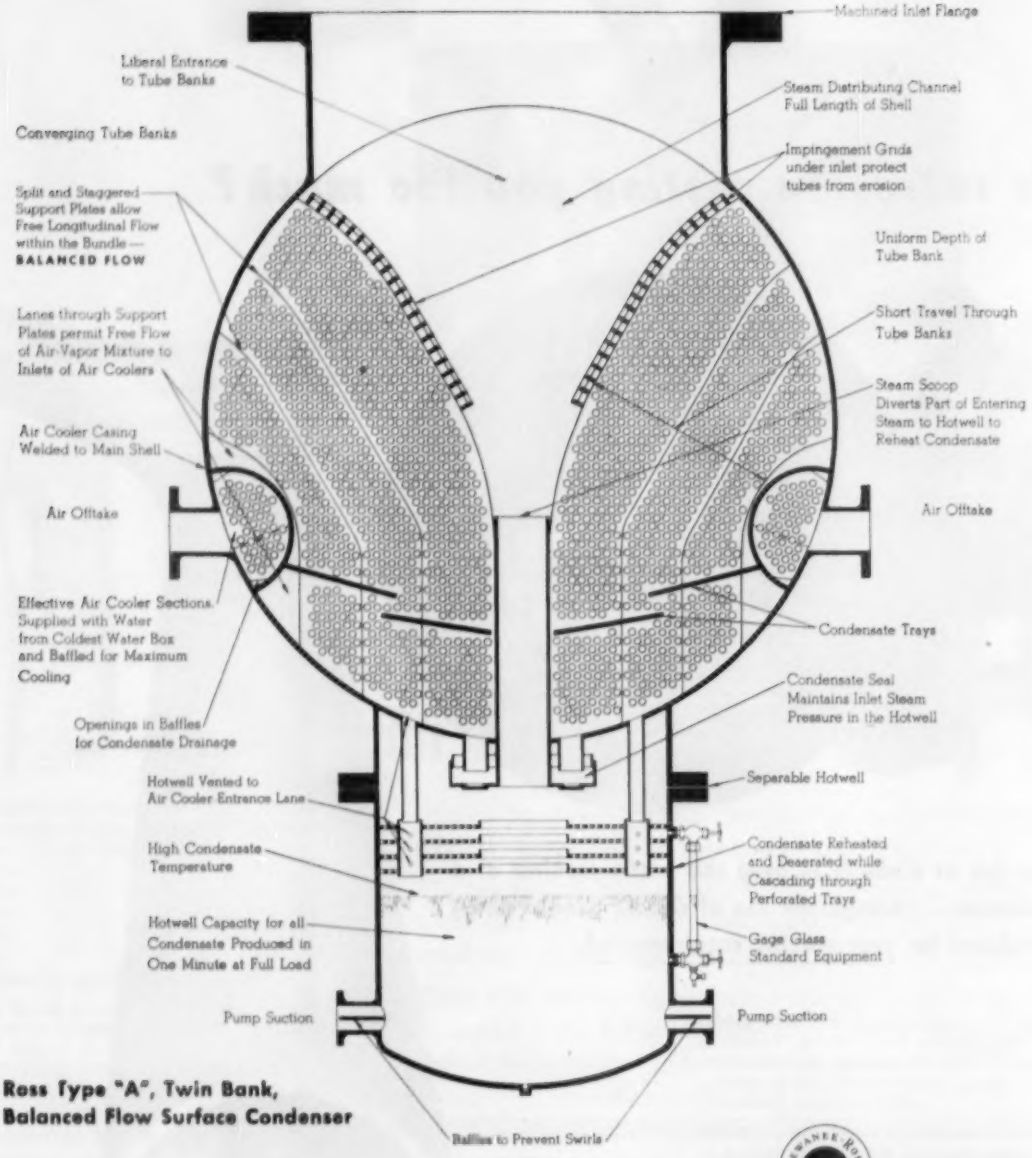
THERE are over twenty-five basic grades of stainless steel tubing, variations of which add up to many more analyses which can be employed in solving your corrosion problems.

Globe's metallurgists and engineers help you minimize the expense caused by corrosive attack. By careful laboratory and field study of your processes and products, they will recommend just which of the many available analyses of Globe tubing is best suited to your job.

Globe's "one source" supply offers seamless and welded stainless, and seamless carbon and alloy steel tubes in a complete range of sizes and analyses. Write for the Globe General Catalog.

Producers of Globe seamless stainless steel tubes — Globeweld welded stainless steel tubes — seamless alloy and carbon steel tubes — seamless Globeiron (high-purity ingot iron) tubes — Globe Welding Fittings

Design features that make Ross Surface Condensers A SOUND INVESTMENT


Machined Inlet Flange
Liberal Entrance to Tube Banks
Converging Tube Banks
Steam Distributing Channel Full Length of Shell
Impingement Grids under inlet protect tubes from erosion
Split and Staggered Support Plates allow Free Longitudinal Flow within the Bundle — BALANCED FLOW
Uniform Depth of Tube Bank
Lanes through Support Plates permit Free Flow of Air-Vapor Mixture to Inlets of Air Coolers
Short Travel Through Tube Banks
Steam Scoop Diverts Part of Entering Steam to Hotwell to Reheat Condensate
Air Cooler Casing Welded to Main Shell
Air Offtake
Air Offtake
Effective Air Cooler Sections Supplied with Water from Coldest Water Box and Baffled for Maximum Cooling
Condensate Trays
Condensate Seal Maintains Inlet Steam Pressure in the Hotwell
Openings in Baffles for Condensate Drainage
Separable Hotwell
Hotwell Vented to Air Cooler Entrance Lane
High Condensate Temperature
Condensate Reheated and Deaerated while Cascading through Perforated Trays
Hotwell Capacity for all Condensate Produced in One Minute at Full Load
Gage Glass Standard Equipment
Pump Suction
Pump Suction
Baffles to Prevent Swirls

Ross Type "A", Twin Bank, Balanced Flow Surface Condenser

The facts and figures on Ross Surface Condensers are impressive. It will be time well spent to have a Kewanee-Ross representative tell you *all* about the design features and distinct advantages of this truly modern line.

Long a leader in the field, the originator of such noteworthy developments as all-welded steel surface condenser construction, Kewanee-Ross is in a key position to meet your requirements *exactly* with standardized or special, large or moderate size, or packaged units.

For the complete story—at your desk—write today.

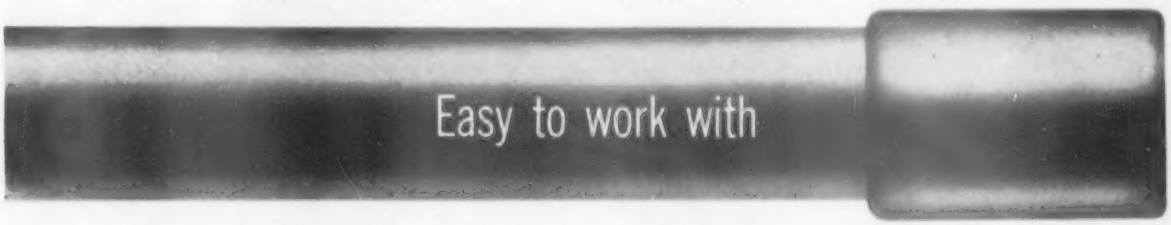
KEWANEE-ROSS CORPORATION
DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION
1417 WEST AVENUE • BUFFALO 13, N. Y.
In Canada: Kewanee-Ross of Canada Limited, Toronto 5, Ont.

KEWANEE-ROSS PRODUCTS
ROSS

Serving home and industry: AMERICAN STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

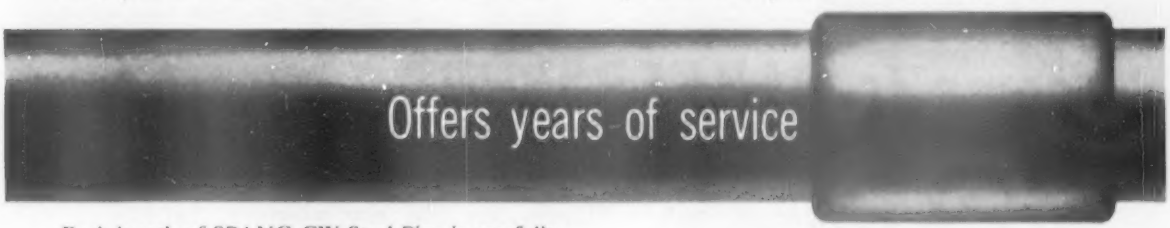
Here's what quality control in SPANG® CW steel pipe does for you:

SPANG CW Steel Pipe is your top-quality choice for top-quality service in rugged oil country installations, such as water systems, air lines, gas lines, oil gathering systems, salt water disposal lines and water flooding lines. That's because only top-quality steel goes into SPANG Pipe.



SPANG CW Steel Pipe is easy to cut, bend, thread and weld, because SPANG uses *top-quality* steel in making pipe . . . carefully controls its manufacture to produce a *top-quality* product.

Because SPANG CW Steel Pipe is so easy to work with, you save installation time. And this time-saving means money saving, too . . . makes your operation more profitable. But that's not all!



Each length of SPANG CW Steel Pipe is carefully sized and straightened . . . descaled inside and out . . . thoroughly tested and inspected before shipment. You get a *top-quality* pipe with years of built-in service.

That's *quality control* at work for you, and you can always count on it in any SPANG or National Supply Product.

Try SPANG CW Steel Pipe on your operations. It's available in a full range of sizes at all National Supply Stores.

NATIONAL BLUE PRODUCTS

SPANG-CHALFANT DIVISION

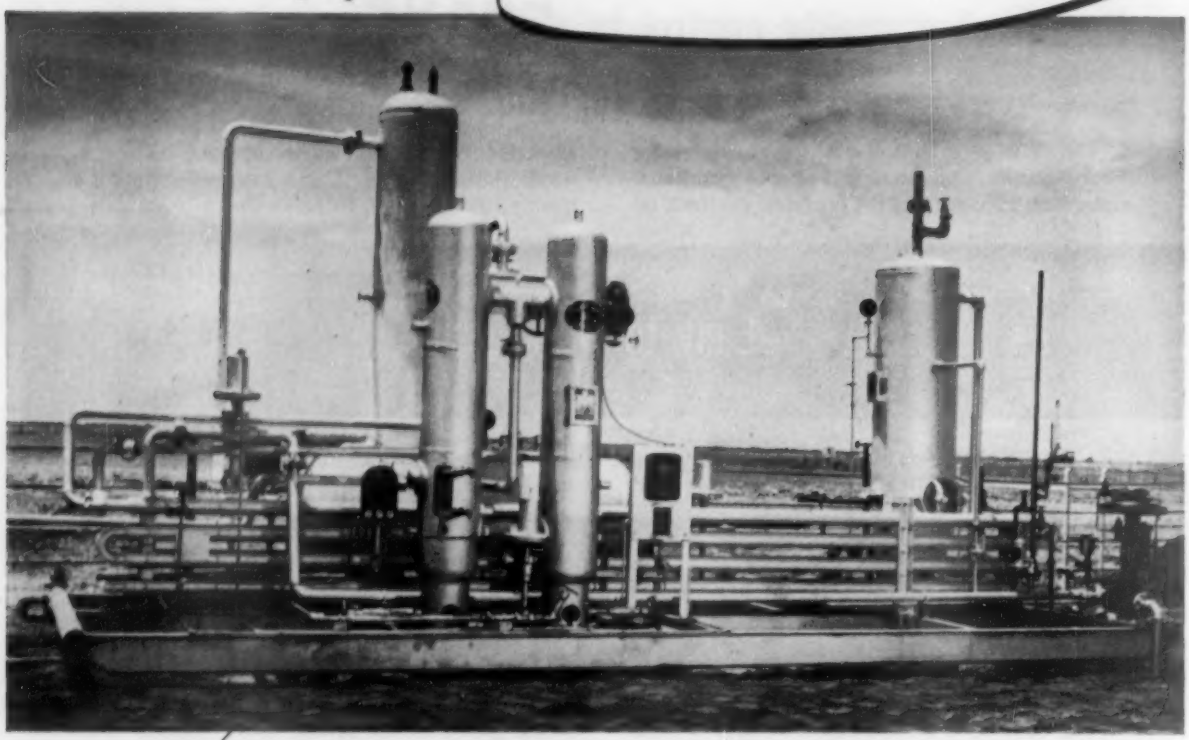
THE NATIONAL SUPPLY COMPANY

Pittsburgh 30, Pennsylvania

DIVISION TUBULAR OFFICES: DENVER, COLORADO • HOUSTON, TEXAS
FORT WORTH, TEXAS • LOS ANGELES, CALIFORNIA • PITTSBURGH, PENNSYLVANIA
TULSA, OKLAHOMA • CALGARY, ALBERTA, CANADA

NATIONAL OIL FIELD MACHINERY AND EQUIPMENT • SPANG STEEL PIPE • SUPERIOR & ATLAS ENGINES

When it comes to COLD separation...



• Parkersburg 6000 lb. 10MMCF Hyreco with Twin Vertical Liquid Knockout.

come to PARKERSBURG

Leader in cold separation, Parkersburg is unsurpassed in experience, both in years and service.

Realizing that various fields and wells have their own factors which determine the efficiency of cold separation, Parkersburg "custom-builds" the Hyreco Gas Processing Unit required to meet those conditions. Parkersburg engineering skill and technical "know-how" combine the standard elements of Hyreco into the one assembly that delivers maximum performance on your well.

There is no compromise with performance when you specify a Hyreco Gas Processing Unit. See your Parkersburg Representative for individually engineered Hyreco installations for your wells.

5420

THE PARKERSBURG RIG & REEL COMPANY • PARKERSBURG, WEST VIRGINIA

Division of Parkersburg-Aetna Corporation

HORIZONTAL AND VERTICAL SEPARATORS • HYRECO • KNOCKOUTS • SCRUBBERS • TREATERS • HEATERS

PIPE LINE PROGRESS

298 MILES OF A. O. SMITH LINE PIPE

helps Service Pipe Line transport "crude" from the Rockies

Service Pipe Line Company now provides a new outlet for Rocky Mountain and Williston Basin Production. Starting at Fort Laramie, Wyoming, the line traverses the southeastern part of the state, Southwestern Nebraska, Northeastern Colorado and the State of Kansas, with a small segment in Western Missouri which connects with Service Pipe Line Company's main North-South system. The initial capacity of the line is to be 160,000 barrels a day. Eventually capacity will reach 200,000 barrels.

It will transport crude oil produced in Wyoming and other sections of the Rocky Mountain area, the Denver-Julesburg Basin and the production of Western and West-central Kansas.

A. O. Smith supplied almost half the 628 mile line — a total of 298 miles in 20 inch and 22 inch diameters. To meet Service Pipe Line's schedules, this pipe was shipped simultaneously from both A. O. Smith Corporation at Milwaukee and A. O. Smith Corporation of Texas.

For over 26 years A. O. Smith has practiced a rigid and high-standard quality control over exacting manufacturing specifications. That's why A. O. Smith pipe made and installed in 1928 is still in operation. That's why nearly every important high pressure line is wholly or in part A. O. Smith pipe.

A. O. Smith line pipe is available in a complete range of sizes and wall thicknesses — from 8⅝ in. to 30 in. diameters.

A. O. Smith also makes the famous "SW-80", E-7010 electrode for field welding of line pipe. Just one electrode for stringer, hot, filler and finish passes.

Through research ... a better way

A.O.Smith

CORPORATION

TUBULAR PRODUCTS DIVISION

Milwaukee 1, Wisconsin

Chicago 4 • Dallas 2 • Houston 2 • Los Angeles 22 • Midland 5, Texas • New Orleans 12 • New York 17 • Pittsburgh 19 San Francisco 4 • Seattle 1 • Tulsa 3 • Washington 6, D.C.

International Division: Milwaukee 1

Put VERSATILITY into Your Drilling Picture

To brighten your drilling picture, investigate the extra profit possibilities of Bucyrus-Erie spudders. Their ability to handle a wide variety of tough jobs with outstanding speed and economy means extra profits for you.

TOP-TO-BOTTOM DRILLING For drilling from grass roots to pay in all kinds of formations, Bucyrus-Eries are efficient, smooth-running machines. They combine big capacity with a sharp powerful spudding action for fast hole production with no loss-of-circulation worries.

WELL COMPLETION Bucyrus-Erie spudders are ideal for drilling-in. Highly mobile and easy to set up, they can move in on the job and get busy as soon as the rotaries move off. With either sturdy semi-trailer mounting or easy-sliding skid base, these modern rigs save valuable hours of moving time.

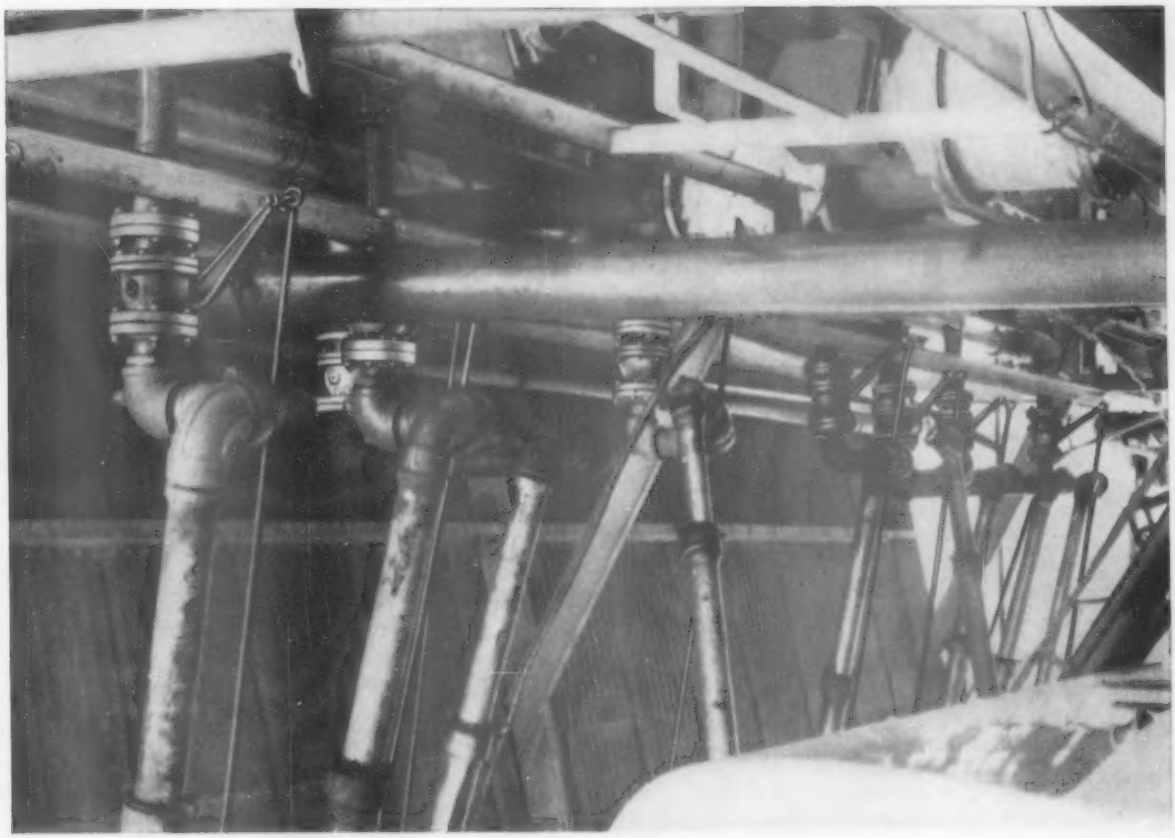
SERVICING JOBS Whether the work is tube-and-rod servicing, cleaning-out, swabbing, or deepening, Bucyrus-Eries handle it in exceptional time. Fast powerfull line pulls and accurate control mean easy handling of tools, bailer, casing or rods. All models can operate with their own telescoping derricks or under stationary derricks. 11554C

Get the full story on these all-round units from your nearby Bucyrus-Erie spudder distributor. Four models: 60-L, 28-L, 36-L, 48-L. Maximum drilling depth, 6000 feet; servicing 7000 feet.

BUCYRUS ERIE

South Milwaukee, Wisconsin

• *First with the Finest in Spudders* •



Busiest loading rack in the Midwest relies on Rockwood Ball Valves

Day in, day out, twenty-four hours a day, the fuel loading rack above fills tank trucks — in record time.

Eight Rockwood Ball Valves perform this grueling operation, opening and closing in trigger time — permitting a full, round flow of fuel — and preventing dangerous oil sludge on the loading pavement by remaining absolutely leak-proof.

What makes Rockwood Ball Valves so outstanding? These four exclusive features assure trouble-free efficiency:

Full Round Flow — no change in shape or volume of fluid stream — no turbulence — no minimum loss.

Quick Opening and Closing — only a quarter turn needed, even under full pressure.

Longer Wear-Resistance — chrome-plated bronze ball withstands abrasion, pitting and scratching.

Leakproof Seal — pressure of fluid automatically positions ball against seat to form tight seal.

If you are not now using Rockwood Ball Valves, send coupon today for complete information. Valves come in all pipe sizes. Tested and listed by Underwriters' Laboratories, Inc.

ROCKWOOD BALL VALVES

FULL, ROUND FLOW

ROCKWOOD

ROCKWOOD SPRINKLER COMPANY
532 Harlow Street
Worcester 5, Mass.

Send me illustrated folder V-4 on Rockwood Full-Flow Ball Valves.

Name .....

Title .....

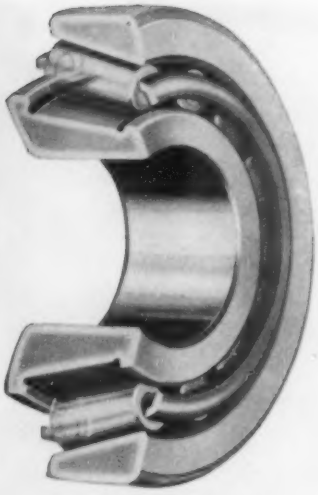
Company .....

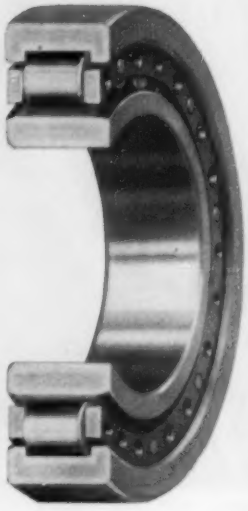
City .....

Zone ..... State .....

WHATEVER YOUR ROLLER BEARING APPLICATION

specify BOWER!





Earthmovers, jet turbine engines, rolling mill equipment, truck axles—you name it! Bower builds a complete line of tapered, straight and journal roller bearings including a size and type to fit *your* product. What's more, these dependable bearings have *proved* themselves in virtually every conceivable type of application. Their built-in quality, skillful engineering and advanced design features provide such important bearing advantages as reduced wear, longer life and lower maintenance requirements. Let a Bower engineer give you full details on the complete Bower line.

BOWER ROLLER BEARING COMPANY
DETROIT 14, MICHIGAN

BOWER TAPERED ROLLER BEARINGS INCORPORATE ADVANCED SPHER-O-HONED DESIGN! Spherically generated roll heads and higher flange with larger, two-zone contact area reduce wear, improve roller alignment and virtually eliminate "end play." This helps hold adjustment and pre-load longer and better. Larger oil groove provides positive lubrication.

BOWER STRAIGHT ROLLER BEARINGS ARE BUILT TO CARRY MAXIMUM LOADS! Integral two-lip race increases rigidity—keeps rollers in proper alignment at all times. Steel cage allows free movement of rollers between races during normal operation. High-grade alloy-steel rollers and races are precision-ground for quieter, smoother operation.

A COMPLETE LINE OF TAPERED, STRAIGHT AND JOURNAL ROLLER BEARINGS
for every field of transportation and industry

AUTOMOTIVE

RAILROAD

FARM

AIRCRAFT

EARTHMOVING

INDUSTRIAL

BOWER

SPHER-O-HONED

ROLLER BEARINGS

Mathieson Quality: *everything's under control*

Prerequisite to quality chemicals is a control procedure that keeps close tab on the product stream as it flows through the plant. Pressures, temperatures, and rates of flow must be maintained within strict limits to assure chemicals that meet top specifications. The control room above helps safeguard the consistent high quality that is typical of *all* Mathieson chemicals.

In addition to quality, there are other considerations of interest to all buyers of chemicals. For example, the protection of multi-plant production facilities . . . 3 major alkali plants, 7 sulphuric acid plants, 6 caustic soda plants, 5 chlorine plants, 3 ammonia plants . . . as well as practical technical assistance with chemical handling and application problems.

Call on us when planning your chemical requirements. Perhaps you can buy to better advantage from one of America's largest producers of basic industrial chemicals.

MATHIESON CHEMICALS

OLIN MATHIESON CHEMICAL CORPORATION

INDUSTRIAL CHEMICALS DIVISION · BALTIMORE 3, MD.

2762

MATHIESON

CAUSTIC SODA · SODA ASH · CHLORINE · SULPHURIC ACID · SULPHUR · AMMONIA · NITRATE OF SODA · BICARBONATE OF SODA · NITRIC ACID · SULPHATE OF ALUMINA · SODIUM CHLORITE PRODUCTS
ETHYLENE OXIDE · ETHYLENE GLYCOL · DIETHYLENE GLYCOL · TRIETHYLENE GLYCOL · POLYGLYCOLS · DICHLOROETHYLETHER · ETHYLENE DICHLORIDE · METHANOL · SODIUM METHYLATE · ETHYLENE DIAMINE

The NEW WHELAND 7¾" x 18" HP-18000 750 HORSEPOWER DUPLEX POWER SLUSH PUMP

FIELD TESTED

BUILT FOR PROFITABLE DRILLING on medium as well as deep wells

BULLETIN ON REQUEST

THE WHELAND COMPANY
CHATTANOOGA, TENNESSEE, U.S.A.

C. W. KLCORN, VICE PRES.
344 NELLIE EDMONSON BLDG
HOUSTON, TEXAS

THEODORE N. LAW, PRES.
J. L. STAUBS, VICE PRES.
E. H. JOHNSON, VICE PRES.

FALCON SEABOARD DRILLING COMPANY
EAST MEZZANINE · STANOLIND BUILDING
TULSA, OKLAHOMA

October 18, 1954

Mr. G. P. Street, President
The Wheland Company
Signal Mountain Road
Chattanooga, Tennessee

Dear Gordon:

We know you are interested in the performance of the new HP-18000 Pump we bought from your company.

As we told you on the phone, it drilled its first 12,500 foot well in Oklahoma without even taking off a pot cover.

We selected this pump to go with the rig to drill the deep test near Parkersburg, West Virginia. It continues to do a good job and has well justified its selection. We are pleased with its performance and are getting excellent service. We recommend it highly.

Yours very truly,

FALCON SEABOARD DRILLING COMPANY

Vice President

WHELAND

ROTARY DRILLING MACHINERY

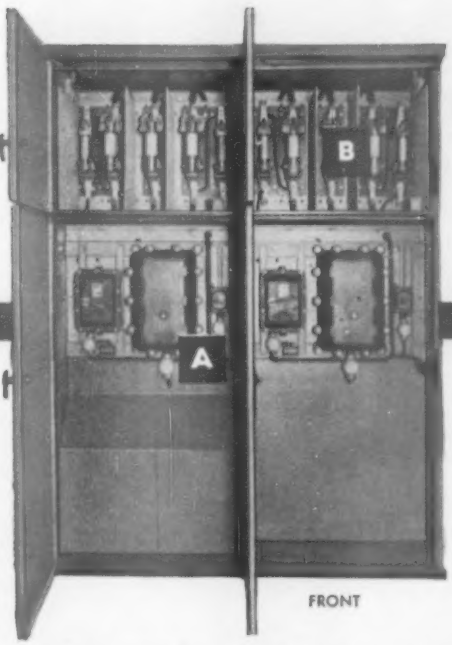
DRAWWORKS • SLUSH PUMPS
ROTARIES • CROWN BLOCKS
TRAVELING BLOCKS • SWIVELS

DOMESTIC DISTRIBUTORS & THEIR HEADQUARTERS: Jones & Laughlin Steel Corp., Supply Division, Tulsa, Okla. • Houston Oil Field Material Co., Inc., Houston, Texas • Iverson Supply Co., Tulsa, Okla. • Lucey Products Corp., Tulsa, Okla. • Superior Iron Works & Supply Co., Inc., Shreveport, La. • Industrial Supply Co., Wichita Falls, Texas

EXPORT DISTRIBUTOR: Lucey Export Corporation, 233 Broadway, New York 7, New York—Broad Street House, London, E. C. 2, England.

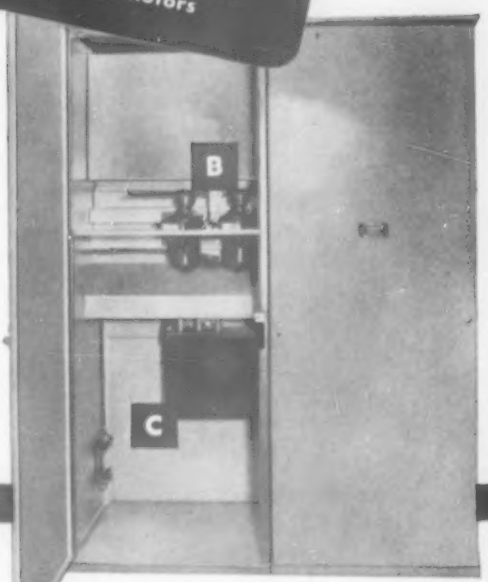
Engineered for SAFE Operation in Semi-Hazardous Locations

Built into every Allis-Chalmers Type H starter is the type and degree of protection dictated by applications. In these particular starters, installed in a semi-hazardous location, all arcing contacts are under oil or in explosion-proof cases.



FRONT

ALLIS-CHALMERS
TYPE H Starters
for 2300 to 5000 Volt Motors



BACK

A All overload, undervoltage, timing and auxiliary control relays, as well as other low voltage switching devices, are enclosed in NEMA VII explosion-proof cases.

B Fuse disconnects cannot be pulled when carrying current. Fuse compartment door is *key-interlocked* to the control transformer primary oil cutouts.

C Main contactor is of the oil-immersed type.

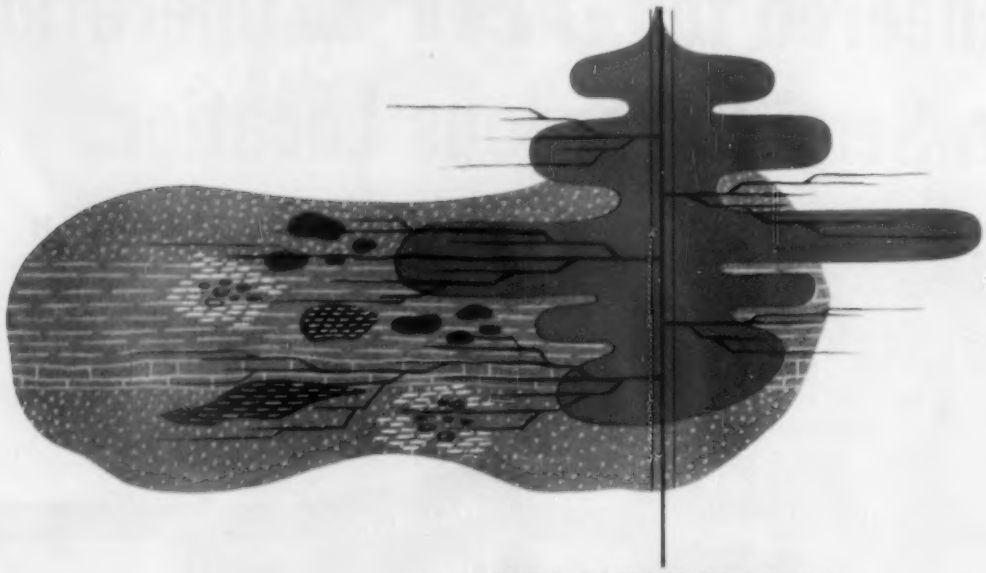
Type H starters are built in a wide range of ratings for squirrel-cage, wound-rotor and synchronous motors — for full or reduced voltage, reversing or non-reversing — with plugging, dynamic-braking and multi-speed features. A new bulletin, 14B6410B, tells the complete story. See your nearby Allis-Chalmers representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Personnel Safety
Steel barriers in the rear compartment prevent accidental contact with exposed live high voltage parts when operating the oil cutouts or removing the interlock key.

A-4446

ALLIS-CHALMERS

THE *ONE* CLEANING AGENT THAT CAN CLEAR *ALL* BLOCKS



HALLIBURTON'S *DOUBLE ACTION* MCA

Acids or single action cleaning agents may be the correct solution for simple cleaning jobs. But most clogged wells are choked by a complex combination of water blocks, viscous emulsions, swollen bentonite, mud sheath and silicates. And these wells respond best to *double action* MCA – the only cleaning agent that can effectively attack all plugging materials to open the way for free flow and increased production.

Both old and new wells can be successfully treated with Mud Cleanout Agent, the proved combination of hydrochloric acid and Morflo, a highly active surfactant. In addition to dissolving the calcareous content of muds, hydrochloric acid frees water from swollen bentonite and changes the bentonite into smaller, non-clogging particles that will not rehydrate even if flooded. Morflo then helps disperse particles by reducing surface tension and Jamin effect so the materials may be easily flushed from the formation. Morflo also has the power to destroy any existing water blocks and to break through any water-oil emulsion.

Each of MCA's active ingredients provides a necessary effect, but it is their combined action that has permitted outstanding production increases. Proved in laboratory tests to be twice as effective as acid alone, MCA in the field has proved to be the most effective agent for making profitable producers from new, low production wells and old, marginal pumpers. Try it on your well and you'll know why MCA is economical, easy-to-use and packed with double action effectiveness. Call your local or district office of the Halliburton Oil Well Cementing Company.

HALLIBURTON

CHEMICAL SERVICES

211 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

REFINERY PROCESS NEWS

PUBLISHED BY REFINERY PROCESS DIVISION, THE M. W. KELLOGG COMPANY DECEMBER 1954

Two Canadian Plants Now Underway Feature Combination Refining

Underlining the current high interest in combination catalytic refining, Kellogg's roster of construction projects underway in Canada includes two new refineries, both of which will be fully integrated with all units controlled from a central point.

It is interesting to note that the first combination catalytic plant to be built on the North American continent was also Canadian—a 5000 BPD refinery completed by Kellogg in 1950 for the British-American Oil Company, Ltd. at Edmonton, Alberta. Since then, combination refining has seen a resurgence reminiscent of the 1930's when it was first introduced by Kellogg in connection with thermal refining.

Principle reason for this is that big savings in both investment and operating costs have been proved conclusively in this and other plants which are now several years old. High on the list of savings achieved in these plants are those related to a more compact design with elimination of costly intermediate storage and duplication of equipment, all of which combination processing makes possible.

20,000 BPD Refinery at Montreal

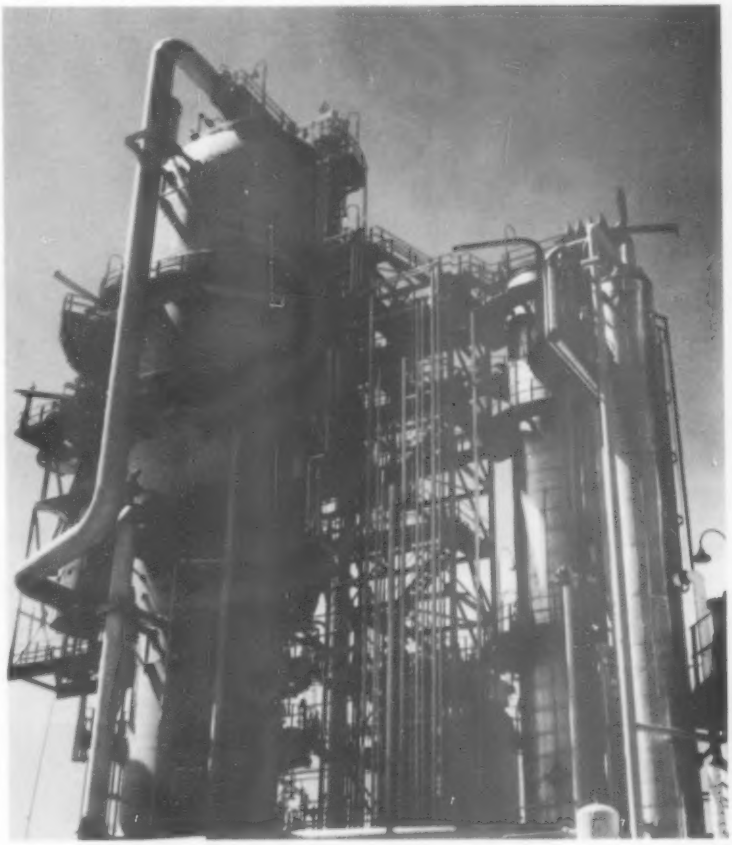
One of the new Canadian plants—a 20,000 BPD refinery located in the Montreal area—is nearing the half way point for Canadian Petrofina, Ltd., a newly formed company. As with its other Canadian projects, Kellogg's wholly owned subsidiary, Canadian Kellogg Company, Limited, is handling procurement and construction, while design and engineering are being carried out at Kellogg's New York headquarters.

The plant is designed with flexibility to handle both Middle East and Venezuelan crudes. Processing facilities for which Kellogg is responsible include topping, vacuum flashing, catalytic reforming, catalytic polymerization, alkylation, and distillate and gasoline treating. In addition, construction activities embrace all required off-site facilities such as a steam generating plant, a cooling water system, wharfage for tankers, crude oil and product storage, and truck, rail and barge loading installations.

12,000 BPD Plant Near Winnipeg

Near the city of Winnipeg, the other new refinery is taking shape for the North Star Oil Company, Ltd. Designed for a rated capacity of 12,000 BPD of Western Canadian crude, the

(continued on reverse side)



Design Innovations Mark Canada's First Model "B" Orthoflow

Completed in a record time of less than a year from start of construction, a major refinery expansion, which includes the first Model "B" Orthoflow Fluid catalytic cracker to be built in Canada, has now been in successful operation for several months. The refinery is that of the British American Oil Company at Clarkson, Ontario. In addition to the Orthoflow—Kellogg's exclusive regenerator-above-reactor single vessel design—the expansion program here included an integrated vapor recovery system and catalytic polymerization with feed desulfurization facilities.

The fourth Model "B" Orthoflow to be placed in operation so far, the Canadian unit departs from its three predecessors in several interesting respects. One of the departures from customary cat cracking practice is the use of electric motor drives on both the centrifugal air blower and the gas compressor. This development, which was prompted by a shortage of steam at the refinery, represents considerable savings in need for boiler house expansion in an area where electric power is relatively cheap.

Another novel feature of the Canadian unit as compared with most previous cat crackers is the absence of refrigeration facilities in the gas recovery system. Availability of unusually cold (lake) cooling water at the plant site made this change possible. An allied feature is a somewhat simplified absorber-stripper design without inter-cooler circuits and gas lift. The plant is the first Model "B" designed to operate with either natural or synthetic catalyst.

The design capacity of the Canadian plant is approximately 12,000 BPD. In its approximately six months of operation, the unit has offered an outstanding example of the flexibility

(continued on reverse side)

FLUID CATALYTIC CRACKING
FLUID HYDROFORMING
LUBE PROCESSING
PETRO CHEMICAL PROCESSING
CAT POLY ALKYLATION
DISTILLATION
VACUUM DISTILLATION
DECARBONIZING DESULFURIZATION

(continued from previous page)

Two Canadian Plants...

plant will see Canada's second Orthoflow cat cracker of the Model "B" type, and in addition will comprise atmospheric and vacuum distillation, gas recovery, catalytic polymerization, LPG production facilities and treating equipment. Kellogg designed all process and off-site facilities. Gasoline production of the refinery will be in the neighborhood of a quarter of a million gallons per day. Other products will include kerosene, diesel oil, heating oil, furnace oil and LPG.

Both refineries are scheduled for completion during the coming year.

Thermal Cracker for Canadian Refiner

Progress on a thermal cracker Kellogg is now building for a refiner in Edmonton indicates that it will be completed this spring after an elapsed time of only 10 months from award.

Kellogg is fulfilling its contract on this job through its subsidiary, Canadian Kellogg Company Limited, which is responsible for all construction and purchasing. The cracker is a 3000 BPD unit which will utilize light cycle oil from an existing cat cracker, and other refinery fractions. Its purpose will be to take additional gasoline from partially refined material which would otherwise go into production of less profitable fuel oil.

(continued from previous page)

Design Innovations...

inherent in the Orthoflow design. Recently the plant was put through its paces at the design rate and the performance of the Orthoflow again proved more than satisfactory.

For further information, technical data, etc., on any refining process, write

REFINERY PROCESS DIVISION

THE M. W. KELLOGG COMPANY

225 Broadway, New York 7, N. Y.

In Canada
The Canadian Kellogg Company, Limited

In Europe
Kellogg International Corporation

KELLOGG PULLMAN

Top photo shows many of the off-site facilities, under construction in September by Canadian Kellogg, at the new Canadian Petrofina Montreal-area refinery. Lower illustration shows progress in North Star process facility area at about the same time. The pedestal which will support the Model "B" cracking unit appears at the center.

Western Canada's First Lube Plant Scheduled for Completion in 1955

A $14 million lubricating oil plant—the first in Western Canada and the second largest to be built in that country—is now well underway near Edmonton, Alberta. Canadian Kellogg Company, Limited, is constructing essentially all of the new plant for Imperial Oil Limited. Now more than a third finished, the plant *is scheduled for completion in 1955.*

Production capacity of the lube oil manufacturing facilities will be some 2,000 barrels of automotive and industrial oils daily. The four main process units under construction by Kellogg are a phenol treating plant, a dewaxing plant, a hydrofinishing plant and a catalytic reformer which will furnish hydrogen for hydrofinishing.

In addition Kellogg is building certain off-site facilities, among which is what is described as the most modern compounding, blending and packaging plant for lube products so far designed; a warehouse; and railroad loading and unloading facilities.

We hope he's on his way to your house..
GASO PUMP & BURNER MFG. CO.
902 EAST FIRST ST., TULSA, OKLA.
Good Health
Good Wealth
Good Cheer
Colicki

Oil field engine takes heavy pulsating loads...*with help of TIMKEN® bearings*

THIS Lufkin Model H-795, two-cylinder, 45-65 horsepower oil field gas engine is designed for use with pumping units, compressors and other applications in the oil fields.

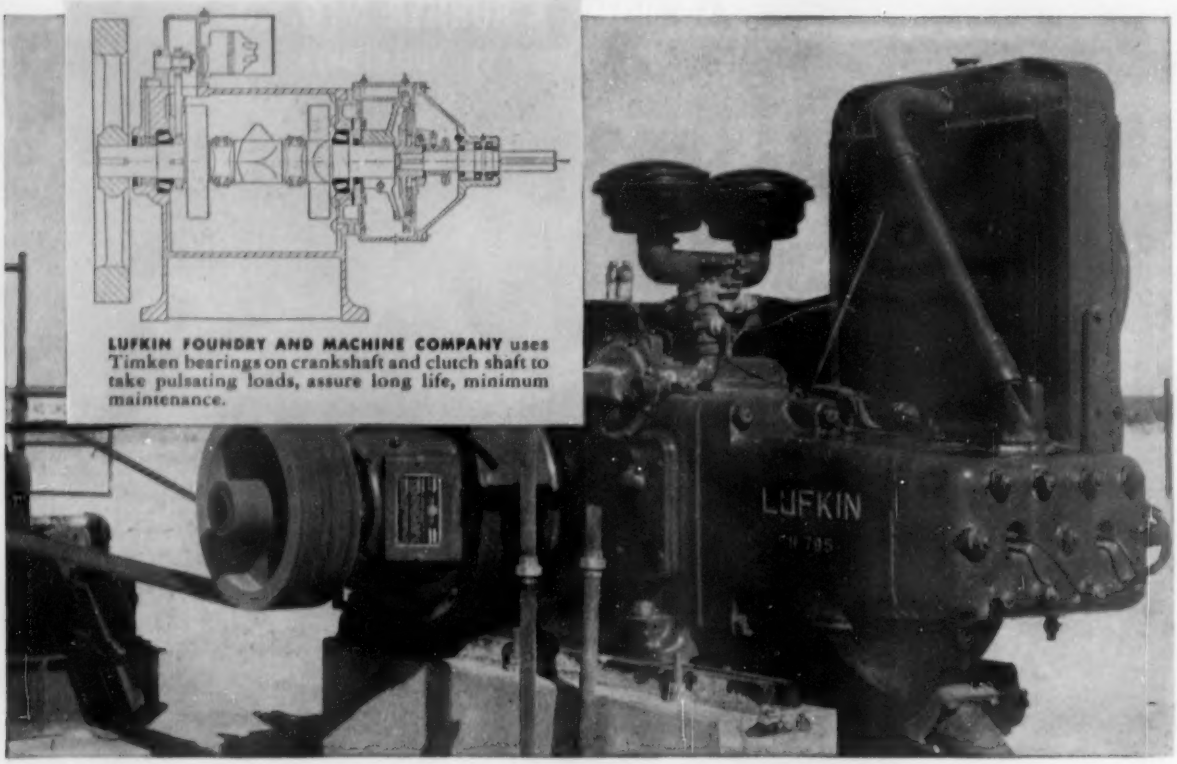
One of the biggest problems in an engine of this type is the ability of the bearings to take heavy pulsating loads. Lufkin engineers solve this by using Timken® bearings on the crankshaft and in the Twin-Disc clutch.

Timken tapered roller bearings are made of the finest steel ever developed for tapered roller bearings—Timken fine alloy steel. In addition, both rollers and races are case-hardened. Thus the tough, inner core of the bearings can absorb heavy load shocks, while hard, wear-resistant surfaces enable the bearings to last the life of the machine under normal operating conditions.

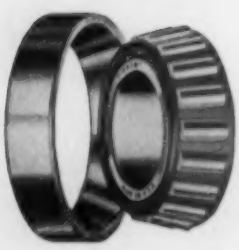
Due to their tapered construction, Timken bearings take both radial and thrust loads in any combination. Full line contact between rollers and races gives extra load-carrying capacity. And because Timken bearings are manufactured to extreme precision limits and finished to incredible smoothness, Timken bearings make friction practically negligible.

When you're building or buying oil field equipment, get all these advantages. Specify Timken tapered roller bearings. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



LUFKIN FOUNDRY AND MACHINE COMPANY uses Timken bearings on crankshaft and clutch shaft to take pulsating loads, assure long life, minimum maintenance.



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

DESIGN LEADERSHIP

The first Timken tapered roller bearing was produced in 1898. Since then the one-piece multiple perforated cage, wide area contact between roller ends and ribs, and every other important tapered roller bearing improvement have been introduced by The Timken Roller Bearing Company.

The Timken Company leads in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels.

NOT JUST A BALL — NOT JUST A ROLLER — THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

They Say—

Texans and Imports

The Governor . . .

"It is in the interest of Texas and the nation that an equitable solution of the imports issue be realized. Continued discouragement of the Texas oil industry, through disproportionate increases in imports, will disrupt our conservation programs, result in growing unemployment and loss of income, undermine the financial structure of our state government, and ultimately make us dependent for our security on foreign oil supplies. . . .

"Idle oil-productive capacity in Texas and throughout the nation is becoming increasingly burdensome. The developers of foreign oil have failed entirely to accept their share of this burden. Their continued failure to do so, in my opinion, is an invitation to legislative import restrictions. . . ."

Governor Allan Shivers.

The Commissioner . . .

"Oil imports are supplanting our Texas production. For example, in December our wells are shut in 15 days because of lack of markets for Texas crude. Texas cuts her allowable on evidence of excess stocks of Texas crude on hand aboveground; then imports increase. This is not fair to our domestic-independent producers who are not importers of oil.

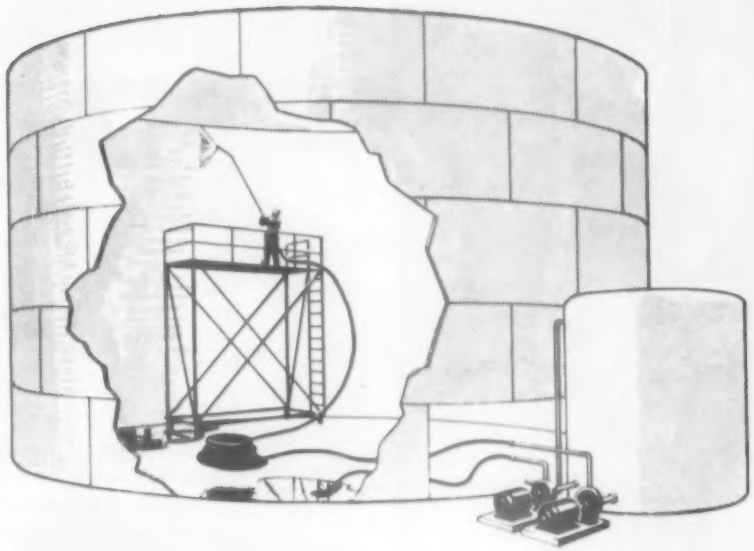
"The average allowable of the Texas oil well at the moment is about 18 bbl. per day per well. Some of the wells around the Persian Gulf produce on the average of 6,600 bbl. of oil per well per day. How can an 18-bbl. well successfully compete with a 6,000-bbl. well?

"Business statesmanship has been appealed for and cried for, but apparently it is not forthcoming. Imports continue to take our markets. This hurts our state revenue, the economy of our country, and cripples our national defense."

Gen. Ernest O. Thompson, chairman of the Texas Railroad Commission.

The Congressman . . .

"Oil imports have steadily increased and there is no cause to believe that they will not continue to increase. It has reached the point where the independents are suffering. The huge oil supplies of the Iranian Government are



How a refinery cut storage tank cleaning costs by MORE than 75%

PROBLEM: Find a low cost method of cleaning an 80,000 gallon petroleum storage tank. Previous manual cleaning method was slow, wasteful, making costs extremely high.

SOLUTION: Utilizing standard equipment such as solution tank, pump, hose, piping and scaffolding (constructed from scrap) they set up a spray method using recommended Oakite solvent detergents. Entire installation constructed from working drawing supplied by Oakite Technical Service Representative.

RESULTS: By eliminating scrubbing, brushing and other manual cleaning methods, entire inside surface of storage tank was cleaned in only 12 hours. *And at 1/4 of their former costs.*

SEE PAGE 19 of the information-packed handbook, "What Petroleum Men Should Know to Simplify Cleaning," for complete details of cleaning and paint stripping storage tanks. This guide is loaded with facts that can help petroleum men realize greater savings in time and money on many maintenance cleaning operations. It's FREE on request. Write Oakite Products, Inc., 44C Rector Street, New York 6, N. Y.

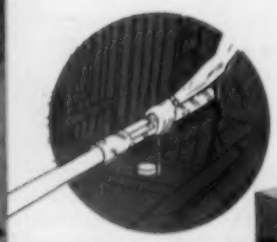
SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS · METHODS · SERVICE

Technical Service Representatives in Principal Cities of U. S. & Canada

Packaging Pioneers

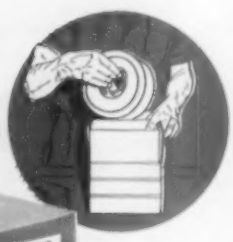
The primary purpose of Mission's *protective packaging* is to assure you that every Mission Product reaches you in the same performance-guaranteed condition in which it left the Mission plant.

Yes, the real beauty of the Mission package is far more than "wrapper deep." Years ago, Mission pioneered protective packaging for its oil field equipment with the firm belief that good equipment deserves good care to prevent damage during shipment. Recently, Mission was the only oil field equipment manufacturer to receive an award for packaging in national competition. All Mission products are clearly marked so that the products may be identified at a glance. The compact boxes may be more uniformly stacked in stock rooms and supply store shelves than unwrapped parts. The next time Mission Products arrive on your location, notice how carefully they have been packaged for protection en route. This is just one more example of the difference Mission makes that makes a big difference in the performance you get.



PISTON RODS

FLUID END PISTONS



PISTON RUBBERS

Nothing but the finest will ever bear

the name of

MISSION MANUFACTURING CO.

P. O. BOX 4209 • HOUSTON, TEXAS

Export Office: 30 Rockefeller Plaza, New York

LP Gas . . . and Beacon Petroleum Company

It wasn't too long ago that gas was flared at the well site. Today this gas has become an important source of revenue for oil producers. With an experienced and aggressive staff, Beacon Petroleum offers producers a service they find impossible to duplicate.

If you have any petroleum products to sell, contact Beacon . . . or if you want to buy petroleum products contact Beacon . . . we have the facilities and know-how to fulfill your every need.

BEACONGAS

BEACON

PETROLEUM COMPANY

TULSA • HOUSTON

MARKETERS OF NATURAL GASOLINE, BUTANE-PROPANE, MOTOR FUEL, FUEL OILS

now on the world market, and there is no satisfactory answer from either our government officials or the importing companies as to where those supplies will be sold.

"I felt in 1950, as I feel now, that legislation would be necessary to protect the domestic-oil industry. . . .

"A continuation of injurious import trends could result in disaster. Adequate ability to produce accessible domestic oil must be maintained at all costs. It will not be maintained if oil imports continue to take over the very market outlets for domestic oil which have provided the incentives necessary for the industry to explore and expand the nation's oil reservoir. . . ."

Cong. Omar Burleson.

The Senator . . .

"There is no question of the need to resolve the import problem on a fair and permanent basis. It has been with us too long, causing confusion and uncertainty among oil producers of Texas and the nation . . .

". . . Anything which disrupts normal expansion of the industry is harmful to both our economy and security. Continuously increasing imports have had such a harmful effect.

"It is in our national interest that a vigorous domestic oil-producing industry be encouraged, and that imports be held to reasonable levels which will not retard our development of defense-oil supplies.

"This problem . . . is even more important in terms of our national security. It is vital that whatever steps necessary be taken to assure a continued healthy domestic oil industry . . ."

Sen. Lyndon B. Johnson.

Gulf and Imports

"If the entire oil industry had increased imports over these earlier years no more than we have done, total oil imports today would be no more than 700,000 bbl. daily instead of over a million barrels . . .

"In view of reductions which have been achieved in the inventories of crude oil and refined products, no further reductions in total stock appear necessary. If, therefore, consumption in the U. S. during 1955 increases by 3 to 5 per cent, as is generally predicted, crude-oil requirements this coming year should average several hundred thousand barrels per day greater than in 1954."

Gulf Oil Corp. in a statement issued in conjunction with announcing a cut of imports during January and February of approximately 4,000 bbl. daily

Each Kel-F lined rupture disc is given a leak detector test and must be proven pin-hole free.

The large stock of controlled ductile metals used in the manufacture of BS&B rupture discs enables us to duplicate a previous requirement as well as affording you a wide selection in pressures — from 5 to 50,000 lbs.

For CORROSIVE Conditions

Equip Your SAFETY HEADS With BS&B Kel-F Lined Rupture Discs!

Whenever BS&B Safety Heads are installed in a location where corrosive conditions exist, an unprotected metal rupture disc may be vulnerable to corrosive attack from either the product or the atmospheric side—or both.

The recommended disc to use under these circumstances is the BS&B Kel-F lined rupture disc, which has for more than 3 years proven its resistance to corrosive attack from strong acids, caustics, chlorine, etc. Kel-F is a trade name for a thermo-plastic film of trifluorochlorethylene, which is also known by the trade name of Trithene. Discs may be specified with the Kel-F lining on either or both sides, as your conditions may require.

The use of Kel-F linings in combination with metals of known mechanical and metallurgical qualities such as Inconel, Monel, stainless steel and nickel means positive, trouble-free protection in highly corrosive applications heretofore impossible.

Thus, through "know-how" attained by years of experience in this highly technical field, BS&B has again provided the Process Industries with a *better* safety device for the protection of closed pressure systems!

For full information on the BS&B Kel-F lined rupture disc and its application to your specific problem, consult your BS&B Office or Representative . . . or write to us direct.

THE "CIRCUIT-BREAKER" OF *Any Pressured System*

BLACK, SIVALLS & BRYSON, INC.
Safety Head Division, Dept. 2-A12
7500 East 12th St., Kansas City 26, Mo.

EFFICIENCY OVER 60 YEARS BS&B RELIABILITY

Our Holiday

That we are overloaded with

GOOD WISHES
for a MERRY CHRISTMAS
and a HAPPY NEW YEAR
for you!

THE Bovaird SUPPLY COMPANY

GENERAL OFFICES
TULSA, OKLAHOMA

83 YEARS OF PROGRESS WITH THE OIL INDUSTRY

For Tool Joints

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". . Nearly 8,000 lb. of coffee were required to meet employe requirements during the past year. . . . The cost to the company—approximately $9,000.

"Add to that the disbursements of cream, sugar, serving equipment, rental space, maid service, laundry, and numerous incidentals, and you have an additional $10,000; a conservative estimate, according to our accounting department.

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"Add all these costs together; assume that each employe will drink two cups of coffee per day, and the cost per cup is 59 cents . . ."

Kenneth Fellows, secretary and personnel director of Houston Natural Gas Corp., in an article appearing in the November issue of The Safety Valve, company publication.

Another Research Lab

Dear Sir:

In the November 1st issue of your magazine, page 62, you published a check list of petroleum research laboratories in the United States. Among those listed, we noted you included the U. S. Bureau of Mines, Bartlesville, Okla., and San Francisco, but made no mention of the laboratories at this station. I should like to mention that we have at this station petroleum production research laboratories and petroleum chemistry and refining research laboratories, in addition to the research laboratories on oil shale . . .

H. P. Rue, Chief
Fuels Technology Division
Region IV
United States
Department of Interior
Bureau of Mines
Laramie, Wyo.

Science Teachers Needed

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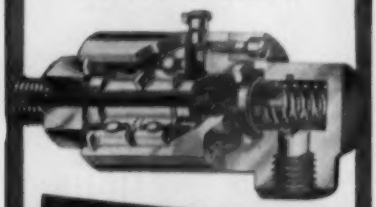

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Get the facts about the new Deublin CHATTER-PROOF Quick-Release Valve

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teachers of science and methematics in our high schools. But . . . there also have been registered this fall more than 100,000 students in high school science and mathematics classes who are being taught by teachers who have not been trained adequately. . . .

"Only half the young men and women who earn teaching certificates in science and mathematics actually teach. . . .

"Professional societies are asked to assist in setting up conferences, institutes, symposia, fellowships, and other activities that would improve the ability of teachers. . . . Societies and their members are encouraged to promote and participate in guidance services for high-school students in which the requisite qualifications and the opportunities for careers in engineering, science, and science teaching are presented realistically. . . ."

Joint statement from the Engineering Manpower Commission of New York and the Scientific Manpower Commission of Washington.

CALENDAR

DECEMBER

30 Industrial Science Secton, American Association for Advancement of Science, annual all-day meeting, Hotel Claremont, Berkeley, Calif.

1955

JANUARY

10-14 Society of Automotive Engineers, golden anniversary annual meeting, Sheraton-Cadillac and Statler hotels, Detroit.

17-18 Kansas Oil Men's Association, annual convention, Baker Hotel, Hutchinson, Kans.

17-19 Pipe Line Contractors Association, annual convention, Hotel Statler, Los Angeles.

26-28 Symposium on instrumentation for process industries, A. & M. College of Texas, College Station, Tex.

27-28 American Chemical Society, symposium on hydrocarbon chemistry, Rice Hotel, Houston.

27-28 Southern California Meter Association, fourth annual instrument short course, Los Angeles Harbor Junior College, Wilmington, Calif.

FEBRUARY

10-12 Seventh Southwestern IRE Conference and Electronics Show, Baker Hotel, Dallas.

13-17 American Institute of Mining and Metallurgical Engineers, annual meeting, Conrad Hilton Hotel, Chicago.

13-18 A.S.T.M. Committee D-2 on Petroleum Products and Lubricants, Rice Hotel, Houston.

14-16 Rocky Mountain section of A.A.P.G., annual regional convention, Billings, Mont.

16-18 National Association of Corrosion Engineers, sixth annual short course for pipeliners, Mayo Hotel, Tulsa.

25 National Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

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The lower the expense of producing source water from wells for water flooding operations, the greater the ultimate profit.

Reda Pumps for source water wells provide many ways for lowering these production costs.

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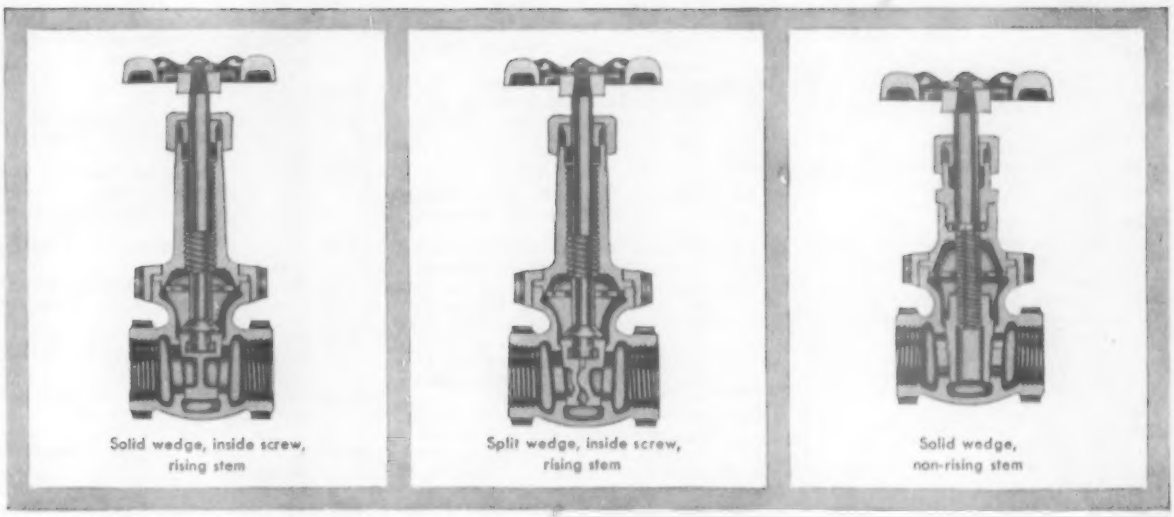
Oh, I see



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VALVES | **FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON**

MARCH

4 Southern Gas Association, transmission management conference, Shamrock Hotel, Houston.
7-11 National Association of Corrosion Engineers, Palmer House, Chicago.
9-11 American Petroleum Institute, Division of Production, Southwestern spring meeting, Jung Hotel, New Orleans.
17-18 Southern Gas Association, Distribution Management Conference, Jung Hotel, New Orleans.
20-23 American Institute of Chemical Engineers, Kentucky Hotel, Louisville.
23-24 Pacific Coast Gas Association, accident prevention conference, Santa Barbara, Calif.
23-25 American Petroleum Institute, Division of Production, Mid-Continent District, Herring Hotel, Amarillo, Tex.
24-25 American Gas Association, gas supply, transmission, and storage conference, Wm. Penn Hotel, Pittsburgh.
27-29 Texas Independent Producers and Royalty Owners Association, ninth annual meeting, Hotel Texas, Fort Worth.
28-31 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Exploration Paleontologists and Mineralogists, annual meeting, Hotel Statler, New York.

28-April 1 American Society for Metals, ninth Western Metal Exposition and Congress, Pan-Pacific Auditorium, Los Angeles.

APRIL

7-8 Rocky Mountain District, American Petroleum Institute, Division of Production, Gladstone Hotel, Casper, Wyo.
13-15 Natural Gasoline Association of America, annual convention, Baker and Adolphus hotels, Dallas.
13-15 American Society of Lubrication Engineers, tenth annual meeting, Hotel Sherman, Chicago.
19-20 Pacific Coast Gas Association, distribution conference, Phoenix.
19-21 Southwestern Gas Measurement Short Course, North Campus, University of Oklahoma, Norman, Okla.
25-26 Independent Petroleum Association of America, midyear meeting, San Antonio.
28-29 American Petroleum Institute, Division of Production, spring meeting of Pacific Coast district, Statler Hotel, Los Angeles.

MAY

1-4 Liquefied Petroleum Gas Association, annual convention, Conrad Hilton Hotel, Chicago.
1-4 American Institute of Chemical Engineers, Shamrock Hotel, Houston.
9-10 American Gas Association, Gas Supply, Transmission and Storage Conference, Hotel William Penn, Pittsburgh.
9-12 American Petroleum Institute, Division of Refining, midyear meeting, Jefferson Hotel, St. Louis.
11-12 Pacific Coast Gas Association, gas supply and transmission and conference of technical session, Palm Springs, Calif.
12-19 Sixth Latin American Congress of Chemistry, Caracas, Venezuela.
14-22 World Wide Chemical Plant and Equipment Exposition and Congress, Frankfurt Germany.
16-18 American Petroleum Institute, Division of Transportation, products pipeline conference, Edgewater Beach Hotel, Chicago.
16-18 Southern Gas Association, New Orleans.
23-25 American Petroleum Institute, Division of Marketing, midyear meeting, Chase and Park Plaza hotels, St. Louis.
26-27 Kentucky Oil and Gas Association, annual meeting, Lafayette Hotel, Lexington.

30-June 1 Chemical Institute of Canada, thirty-eighth annual conference and exhibition, Quebec City, Que.

JUNE

5-9 Canadian Gas Association, annual meeting, Sheraton-Brock Hotel, Niagara Falls, Ont.
6-10 American Petroleum Institute, Division of Production, midyear committee conference, Brown Palace Hotel, Denver.
6-15 Fourth World Petroleum Congress, Rome, Italy.
9-10 Natural Gas and Petroleum Association of Canada, Royal Connaught Hotel, Hamilton, Ont.
9-10 Pennsylvania Grade Crude Oil Association, annual meeting, Hotel William Penn, Pittsburgh.
11-15 Petroleum Equipment Suppliers Association, annual meeting, Banff Springs Hotel, Banff, Alberta, Canada.
16-18 Interstate Oil Compact Commission, Denver.

28-July 1 American Society for Testing Materials, Chalfonte-Hadden Hall, Atlantic City, N. J.

Joint by Joint... the "B-36"

... MOVES AHEAD

• Another 40′ joint of Transcontinental Gas Pipe Line Corporation's 36″ gas line is lowered in and welded. As welds were completed, joint sleeves were applied and doped. Pipe was never moved after welds were completed.

Hydrostatic tests of the line failed to show any leaks in pipe or welds, proving another advantage of the "sewer-pipe" method for laying giant pipe lines.

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The relief valve takes the place of the regular swab valve body and may easily be installed in the field on any Guiberson Tubing Swab. Valve is factory set to support a predetermined column of fluid and is responsive only to fluid pressure (fluid column) and not to line load. Parts subject to wear by high velocity fluid are corrosion resistant and long-lived.

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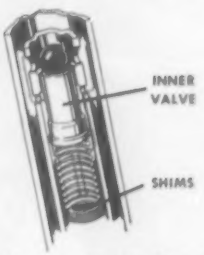

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THE OIL AND GAS
JOURNAL
TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 S. Cheyenne, Tulsa, Oklahoma. Phone 3-6291. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

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JOURNALLY Speaking

Seasonal Solicitude

THIS is the Christmas season, the season of good will among men, when people just naturally seem to want to do nice things for others.

That may account for the recent series of exchanges of favors and niceties engaged in by our circulation manager, Hanson Pigman, known around our shop as "Doc" for the very logical reason that he's the only member of his family who is not a doctor.

People confide in Doc, and write him intimate, personal notes. It could be because of his magnetic personality and charitable nature (though we doubt that). Perhaps it is because he writes such charming solicitation letters inviting people to subscribe and turns down subscription applications from people outside the industry with such diplomatic warmth and grace. We believe the real reason is that people figure he doesn't have much to do because the editors write such good stuff that the Big Yellow Book sells itself.

At any rate, Doc Pigman is a sort of Father Confessor and personal trouble shooter for the family of Journal readers.

Recently Doc has received a number of letters from people who want to subscribe to the Journal so they can check on the activities of companies who are trying to sell them oil leases on government lands. Doc politely replies that the Journal won't be of any help to them on such problems, and guardedly suggests that mail-order oil leasing might have certain aspects of a racket designed to enrich the middle man rather than the lease buyer. He tells them to write to the U. S. Bureau of Land Management in Washington for information on how to lease government lands directly, if that's how they want to invest.

One of these letters came from a Chicago widow who works in a clothing factory. She had already invested some of her hard-earned savings in a lease on an unproductive 80 in an unpromising area in the wilds of Utah and was beginning to entertain some doubts about the sincerity of the lease broker's glowing prospects of easy wealth to be achieved through further investment with him.

Big-hearted Pigman was so touched that he wrote her a long letter explaining the economic and geological facts of life, and the saddened but enlightened widow-woman showed her gratitude by sending him a big box of homemade Bohemian prune-filled pastries. Wasn't that nice?

Christmas-gift shopping is another activity of the Pigman Personal Service Bureau. The wife of a petroleum engineer now in military service wrote that she would like to get her husband some technical books so he wouldn't be so rusty at his trade when Uncle Sam gets through with him. But she didn't know what to order, so she put her trust in our Mr. Pigman. Naturally, Doc came through, and sent her a choice selection, appropriately gift-wrapped.

Most intimate of all—and the greatest tribute to the efficacy of the Big Yellow Book as a promoter of good relations and cementer of family ties—was a letter from a man who explained that he was not renewing because his subscription was a present from a young lady and "she is to become my bride this month so we will read the same Journal." We're just a Big Yellow Cupid.

But some people have the gimme's. Like the guy who is jealous because a lady in California got an ash tray *(this space November 29)*. He wrote that his wife also reads the Journal and "We will take an ash tray—even a used one. We seem to have dozens of them in this house until someone wants one. Then they hide. Remember—an ash tray or we switch to Wheaties (when they run articles on electric logging)." The guy's out of luck. We've mailed out our last ash tray (we hope).

But, ash trays or not, good old Uncle Doc Pigman joins us in personally wishing all Journal readers

Merry Christmas

Henry D. Ralph.

Season's Greetings
H C Smith
OIL TOOL CO.

How to get more gas exchanges

A FINE example of cooperation and good sense—international and intercompany—is last week's agreement to exchange gas and allocate supplies to markets throughout western United States and Canada.

One more step is needed to promote further exchanges of this sort: A treaty or firm intergovernmental agreement making it plain that when gas crosses an international border under a long-term contract the governments of both countries will respect the contract and will give equal treatment to consumers on both sides of the line.

Gas from the Canadian Rockies is now scheduled to reach the U. S. Pacific Coast. Other Canadian gas is now coming into Montana, and more is sought for a proposed line in Minnesota. Eastern Canada is now getting American gas from two lines crossing the border near Detroit and near Buffalo.

BUT IN EACH OF THESE INSTANCES, consumers are fearful that a foreign government—over which they have no control and which has no interest in them—will sanction discriminatory price treatment, or, worse, curtailment of service due to real or fancied needs in the originating country.

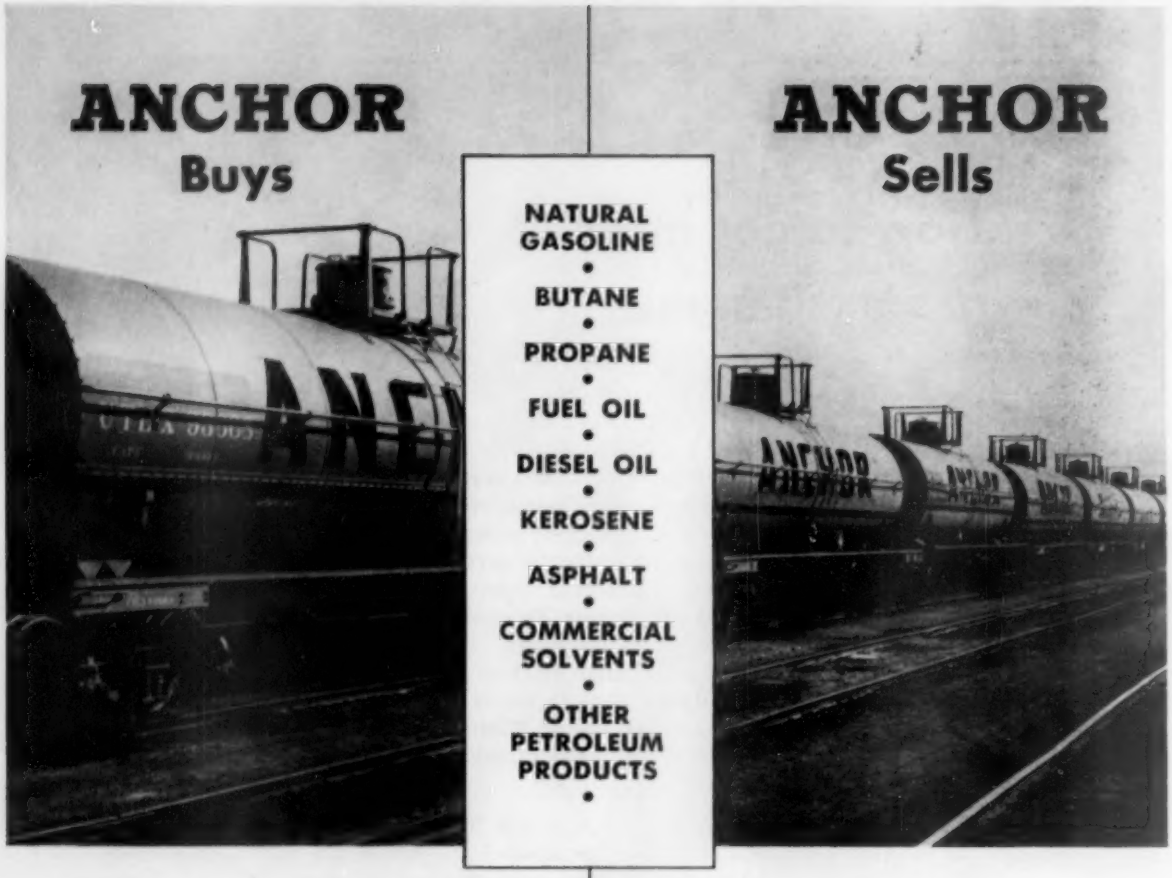
These fears are not imaginary. Canada has statutes which could be applied with such results. And Canadian consumers don't entirely trust American political bodies. They recall our wartime rationing which curtailed gas to some consumers.

International trade in natural gas is unlike that in any other commodity except perhaps electricity. Contracts must be for long terms in order to develop supplies and markets and to sustain a specialized carrier. Gas can't be stored, shipped by alternate means, or easily shifted to other markets. Once a reserve is dedicated to and accepted by a given market, the arrangement should not be upset by subsequent restrictions.

EITHER COUNTRY SHOULD BE FREE, of course, to impose tariffs, price restrictions, quotas, or embargoes on import or export of gas as to the future. But such exercise of sovereignty should not apply to contracts and projects already in operation and once approved by the constituted authorities on either side of the border.

Mexico, too, has gas reserves which American buyers hesitate to tap because of the international border. Again both countries would benefit by a top-level agreement binding both to maintain the terms of a gas exchange as originally agreed upon. So why not a gas treaty covering the whole North American Continent?

All concerned would benefit by letting gas movement be governed by economics rather than politics and by guarantees that there will be no discrimination at an international boundary.



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THIS WEEK . . . . . IN THE NEWS

MERRY CHRISTMAS: This Christmas cross of 115 bulbs atop the Wood River alkylation unit of Standard Oil Co. (Ind.) reflects in the water in the foreground to form a perfect picture for the coming yuletide. Because they're tall, refinery units all over the nation are used at this season of the year as a decorative way for the oil industry to express its Christmas greetings.

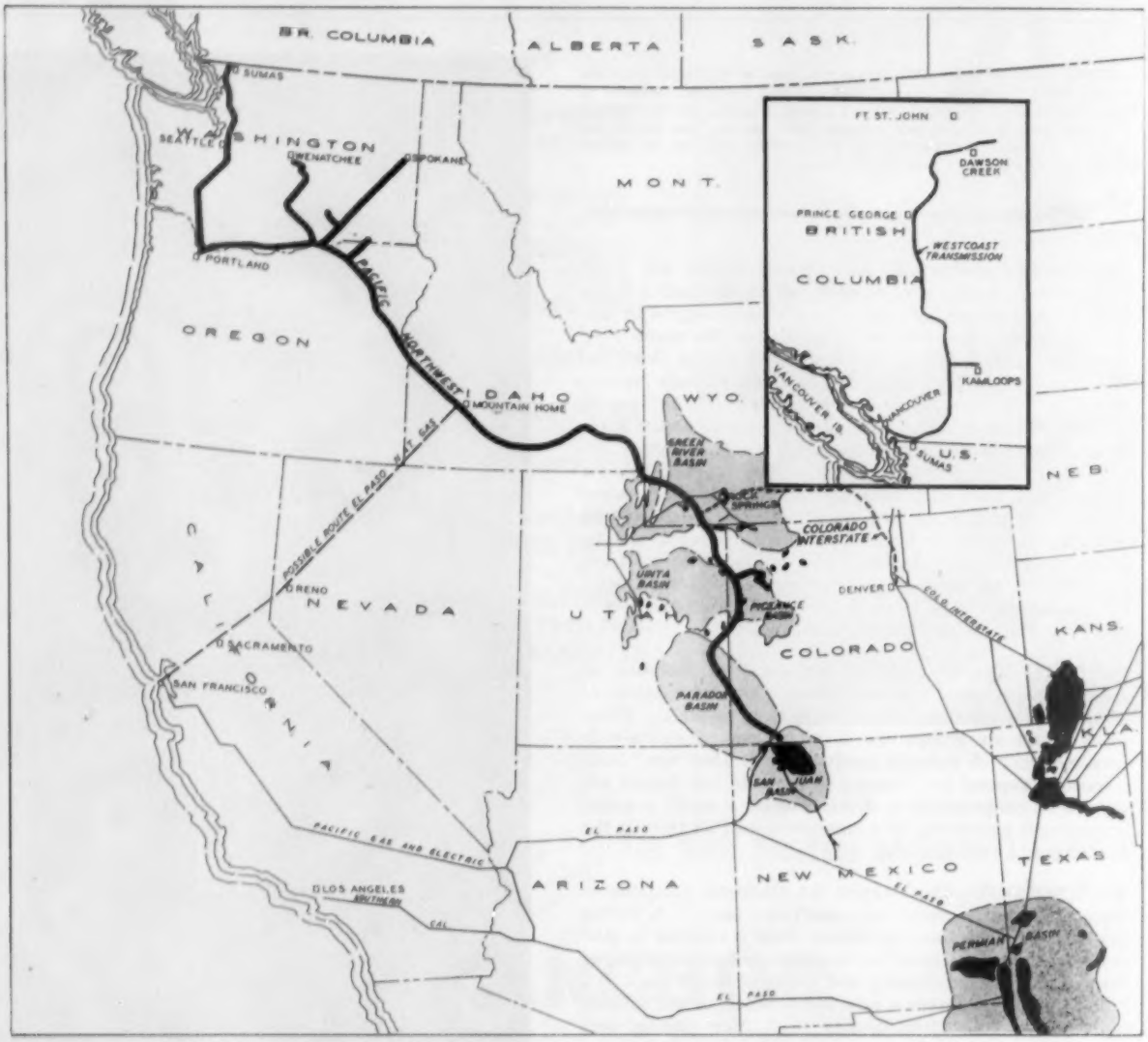
PIPELINES—A three-company agreement that will result in supplying much of the western half of the United States with gas was signed last week. . . . The deal, biggest in natural-gas history, saw two old rivals, Pacific Northwest Pipe Line Corp. and Westcoast Transmission Co., Ltd., bury the hatchet. . . . The third party involved was El Paso Natural Gas Co. . . . The outgrowth of the deal will be moving 300,000,000 cu. ft. of gas daily from Canada's Peace River area to the U. S. for distribution along the West Coast. . . . The construction will form a grid system that will link the transmission lines that carry gas throughout the western U. S. . . . ¶Construction of a main gathering system to feed Alberta's gas into the huge Trans-Canada pipeline will be constructed, but the question of who will move the gas from the fields to the trunk line is still undecided. . . . Alberta Gas Trunk Line expects to decide soon on whether it will build the $20 million feeder system. . . .

IMPORTS—The congressional battle against excessive oil imports shapes up as representatives of six organizations of domestic producers make war talk in Fort Worth. . . . Presidents of the six groups will form nucleus of nation-wide pressure-group of domestic producers. . . . They won't back a specific proposal for Congress to consider, but instead will depend on congressmen to decide whether a tariff, a quota, a reciprocal agreement, or a combination of all three is the best answer to the problem. . . .

TECHNOLOGY—Don't expect the electronic computer to replace the human brain—they aren't on a par. . . . A Mellon Institute researcher says the human brain is superior to electronic gadgets in at least two respects—it has 10,000 times the memory storage capacity and it can smell and taste. . . . ¶M. W. Kellogg unveils a new modification of cat reforming which it calls Orthoforming. . . . New process uses Orthoflow process in Hydroforming. . . . ¶A.I.Ch.E. hears about Standard Oil Development's new Fluid Char Adsorption, a gas-separation process using the fluidized solids technique with pulverized charcoal. . . .

INTERNATIONAL—New anti-Communist government in Guatemala may knock down the barriers to foreign oil companies. . . . Several big operators are interested in doing exploration there if terms are considered satisfactory. . . . ¶New oil legislation also is scheduled to be considered in Libya early in 1955. . . . ¶New refinery at Batangas, the first in the Philippines, will meet about a third of the republic's petroleum requirements. . . . ¶West Australian will try another test near the country's first commercial oil producer. . . .

EXPLORATION—A gas discovery in Powder River County, Montana, brings first production to the northeastern section of the big Powder River basin. . . . The well flowed 15,500 M.c.f. daily through casing-tubing annulus. . . . ¶A wildcat 10 miles southwest of Gove, Kans., brings western Kansas its second Arbuckle discovery. . . .



Three-way contract signed in . . .

. . . Biggest Deal in Gas History

Henry D. Ralph

TULSA. — The biggest gas-transmission project in history will result from a three-way deal signed here last week between Pacific Northwest Pipe Line Corp., Westcoast Transmission Co., Ltd., and El Paso Natural Gas Co.

The agreement will bring Canadian gas to California, clear the way for serving the Pacific Northwest states with gas from southwestern United States, and form a grid of transmission lines linking all major consuming areas west of the Rockies with all the big gas-producing areas in the western half of the continent.

The agreement will involve construction of approximately 2,600 miles of big-inch transmission lines, plus laterals, compressor stations, and processing plants, costing in the neighborhood of $400,000,000. Close to 1 billion cubic feet of gas per day may be moved through the three systems.

Pacific Northwest, which already had a permit to build a transmission line from the San Juan basin in southern Colorado to Washington and Oregon, will purchase 300,000,000 cu. ft. of gas per day from Westcoast Transmission, taking delivery at the Canadian border. It will use 50,000,000 cu. ft. of this for its Washington markets and resell 250,000,000 cu. ft. per day to El Paso Natural.

El Paso will take delivery at some point midway on Pacific Northwest's line, probably near Mountain Home,

Idaho, and build a new line to the San Francisco Bay area where the gas will feed into the central California distributing system of Pacific Gas & Electric Co.

Westcoast Transmission will build 650 miles of trunk line from the Peace River area of northern Alberta and British Columbia to Vancouver, B. C., a short spur is planned to the international boundary near Sumas, Wash., to deliver the 300,000,000 cu. ft. per day to Pacific Northwest.

The only thing that could kill the agreement would be the Federal Power Commission's refusal to approve Pacific Northwest's modified plans and to give it permission to import gas. However, the revised plans are expected to meet FPC approval.

The Canadian gas is scheduled to come into the United States during the late months of 1957, so the El Paso line into California probably will not be started immediately.

Construction will start on the other two trunk lines in the very near future. Pacific Northwest is telling its distributors to count on receiving San Juan basin gas during the summer of 1956. Westcoast Transmission hopes to start its gas flow in late 1956 and to achieve full service to Vancouver and other British Columbia communities before the fall of 1957.

The signing . . . The three-way agreement culminates 5 years of planning on the part of the principals—and almost as long a period of bitter wrangling among them. All parties profess to be extremely happy over the outcome.

The agreement was signed in the office of C. H. Wright, president of Sunray Oil Corp. Sunray has stock interest in Westcoast Transmission and in Pacific Petroleums, Ltd., of Calgary, Alta., which fathered the Westcoast project. Sunray's Canadian subsidiary, Sunray Oil Co., and Pacific Petroleums both have extensive gas-producing holdings in the Peace River area.

Wright was assisted in getting the parties together by K. S. Adams, chairman of the board of Phillips Petroleum Co. Phillips has gas production in both the San Juan basin and the Peace River region. The company also has a contract to supply a large amount of gas to Pacific Northwest.

What is possible . . . The allocation of markets, supplies, and facilities among the three transmission companies is a logical one, and should benefit the entire western half of the U. S. and Canada. There appear to be no obstacles to putting it into effect.

The results will be, in effect, an interconnecting grid system whereby no consuming area will be dependent upon a single supply of gas.

Gas developed in the Rocky Mountain states will have a market throughout the entire U. S. Pacific Coast. Canadian gas will supplement this supply. British Columbia will be served by its own gas, and, conceivably, could get some gas from the United States in case of a break in the Westcoast line. The fast-expanding California market will get either the San Juan basin gas it has been fighting for or its equivalent in Canadian gas.

Canadian gas entering the Pacific Northwest system in the north and San Juan basin gas entering at the southern end of the line will back up against each other near the El Paso take-off point, so there may actually be a physical trade of gas, with Washington and Oregon burning Canadian gas and California getting Colorado and New Mexico gas.

Except for the 50,000,000 cu. ft. per day which it will use itself, Pacific Northwest legally is only a middle-man and transporter buying Canadian gas and reselling it to El Paso for the California market. The reserves of gas in the Rockies which Pacific Northwest will tap will remain dedicated to its markets in the Northwest states.

The link-up also affects markets east of the Rockies. Colorado Interstate Gas Co. will build a line from a connection with Pacific Northwest in southwestern Wyoming into Denver, giving that area an alternate source of gas. The Denver region is now served by two lines from the Hugoton and Panhandle fields of Kansas, Oklahoma, and Texas.

Hugoton and Panhandle fields also serve a network of transmission lines fanning out north and east as far as Chicago and Detroit. Additional gas lines run through the Panhandle from the great Permian basin gas reserves of West Texas and Southwest New Mexico. The Permian basin also is connected to California by two El Paso lines, one of which runs via a northern route through the New Mexico and Arizona portions of the San Juan basin.

Thus there will be physical facilities for serving consumers from the Pacific Coast to the Great Lakes with gas from fields from northern Canada to West Texas. In times of emergency, such as a break in the company's line, the existence of this "grid" could be a big safety factor in preventing any area from being without gas.

Construction plans . . . The construction plans of Pacific Northwest and Westcoast will be carried out substantially as they were presented to the FPC earlier this year, with modifications required by the new agreement.

Westcoast will lay a 30-in. line, instead of 26 in., from Dawson Creek, B. C., to Vancouver, a distance of about 650 miles.

Pacific Northwest will redesign and enlarge the section of its main line from Umatilla, Ore., on the Columbia River, to Bellingham, Wash., and extend it to the Canadian border at Sumas. Compressor stations on the northern half of the line will be designed to pump gas in either direction.

Costs and capacities . . . The projects of Pacific Northwest and Colorado Interstate total about 1,500 miles of trunk line and are estimated to cost over $200,000,000. The Westcoast project involves 650 miles of main line and is estimated to cost $120,000,000. The El Paso line will be about 500 miles in length, but its diameter and cost have

AMONG THOSE PRESENT when the Pacific Northwest-Westcoast Transmission-El Paso Natural deal was signed were (left to right) C. R. Williams, president of Pacific Northwest; D. P. McDonald, vice president of Westcoast Transmission; Leon M. Payne, secretary of Pacific Northwest; Ray C. Fish, chairman of Pacific Northwest; Frank McMahon, Westcoast Transmission president; and C. H. Wright, chairman of Sunray Oil Corp. The agreement was signed in Wright's office.

not yet been determined. Numerous gas-processing plants will also be constructed in connection with the three projects.

Westcoast expects to develop markets in British Columbia for between 60,000,000 and 100,000,000 cu. ft. of gas per day initially, in addition to the 300,000,000 it will export, but is planning its line to handle 650,000,000 cu. ft. per day with the addition of more compressor stations.

Pacific Northwest plans to deliver around 240,000,000 cu. ft. per day to its own markets during its first year of operation, and 357,000,000 cu. ft. per day by its sixth year.

In addition to the 250,000,000 cu. ft. of Canadian gas it has contracted for, El Paso is developing gas production of its own in Utah, and may design its line to move some of this gas to California.

Thus the miles of transmission line, volume of gas, and total investment add up to the biggest gas project ever put into action by a single agreement.

Past battles . . . Many obstacles and rivalries prevented this three-way deal from being concluded earlier.

Both Pacific Northwest and Westcoast had been fighting for the Washington-Oregon-Idaho market. California and El Paso wanted San Juan basin gas reserved for them. Pacific Northwest didn't want to serve Vancouver. Westcoast couldn't afford to serve Vancouver without selling substantial volumes to somebody in the U. S., but consumers in the Pacific Northwest region didn't want to be dependent on a foreign source of gas.

Both Pacific Northwest and Westcoast Transmission proposed several schemes and routes during the past 5 years. Other promoters tried to get into the act, including two or three proposals to bring gas from southern Alberta across the Rockies into the Inland Empire and the Puget Sound region.

A showdown was held before the FPC last spring in an omnibus hearing which washed out all contenders except Westcoast and Pacific Northwest.

On June 18 the FPC ruled in favor of Pacific Northwest. The decision hinged chiefly on the belief that such an important consuming area—the only heavily populated region in the U. S. not served with natural gas—should not be dependent on Canadian gas for two reasons:

. . . The Westcoast line will traverse narrow mountain passes in the Canadian Rockies where heavy snows could break the line and delay repairs.

. . . Canadian laws governing the export of gas leave room for fear that the movement of gas might be curtailed or its price increased by government authority.

Westcoast immediately brought court action against the FPC, demanding reconsideration of this decision, and putting a legal block in the path of Pacific's plans for financing its project. This suit will now be withdrawn, and Pacific Northwest expects to satisfy FPC as to its financing plans within a short time.

Next step . . . Pacific Northwest must now file a new application with FPC for authority to enlarge its line and connect to the Canadian border, as well as for an import permit. However, its original certificate stands, and it is proceding with construction plans.

No objection to importing the gas is expected from FPC under the new arrangement because Canadian gas will simply be a supplemental source of supply, not the sole source.

Both Westcoast and Pacific have done most of their survey work for their routes and have started to obtain rights-of-way. Pacific has contracted for pipe and is negotiating for compressors and processing equipment.

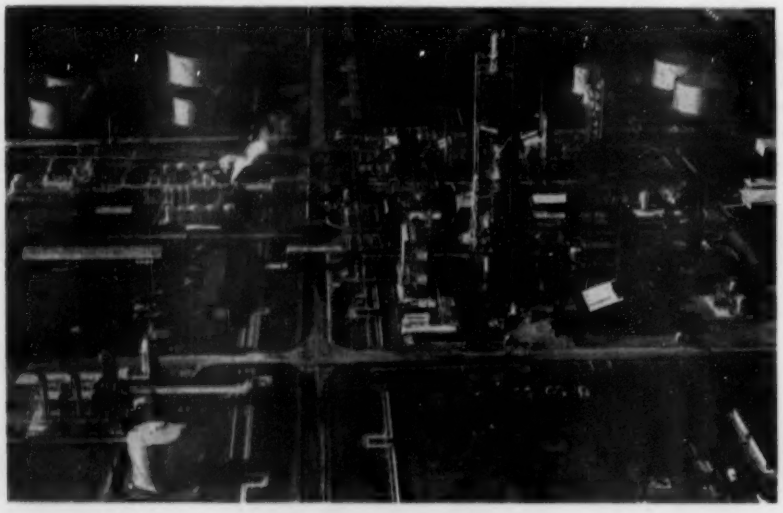
Exploration . . . There has been a big upswing of exploratory drilling along the proposed Pacific Northwest route. There currently are 48 wells being drilled in four states, with most of the wells a direct result of the pipeline plans.

Scene of the majority of the activity is Colorado. Eleven wildcats are being drilled in southwestern Colorado and eight in the northwest part of the state. In Wyoming, six wildcats are underway, including one being drilled by El Paso Natural in Sublette County.

El Paso Natural also is testing the Vale-Ontario basin in western Oregon with a 6,500-ft. wildcat.

Other projects along the route include 18 active operations in northern New Mexico and four wildcats in Utah. Pacific Northwest is among the companies active in New Mexico.

In the Peace River area, development drilling is expected to increase immediately now that an outlet for gas is in prospect. In addition to Pacific Petroleums and Sunray, operators in the area include Peace River Natural Gas Co., Canadian-Atlantic Oil Co., Hudson's Bay Oil & Gas Co., and Phillips Petroleum Co.



General Petroleum's Refinery Warms Up

The Pacific Northwest will make its biggest stride in achieving self-sufficiency in refined products about January 1 when General Petroleum Corp. places its Ferndale, Wash., refinery on stream. Initially, the 35,000-bbl. plant will process 26,000 bbl. of crude daily. This feedstock will include 15,000 bbl. of Canadian crude piped to the plant through a spur line of Trans Mountain Oil Pipe Line Co. Ventura and eastern Venezuelan crudes also will be used. Major units at the refinery are a Thermofor catalytic cracking unit, a Sovaformer, and a catalytic polymerization unit.

Sinclair Inspects Properties

HOUSTON.—Sinclair Oil & Gas Co. last week moved a step further toward a $108 million purchase which would improve the company's productive position with an estimated 70 million barrels of crude reserves now held by American Republics Corp.

Headed by P. C. Spencer, president of Sinclair Oil Corp., and Torkild Rieber, American Republics board chairman, a group of about 30 officials of the two companies were in Houston to look over American Republics' Gulf Coast properties.

Under plans now being negotiated,

American Republics would be dissolved and holders of its 1,500,000 outstanding shares would be paid $72 a share for the stock. A Sinclair spokesman said approximately $25 million in cash is involved in the deal with the remainder of the purchase to be made in oil-purchase payments.

Negotiations were first revealed last month in New York where Rieber said the deal is subject to American Republics stockholder approval *(The Oil and Gas Journal, November 8, page 117)*.

Rotary Rigs at Year's High

TULSA. — Rotary drilling in the United States and western Canada climbed last week to a new high level for the year. Operating rigs, as reported by Hughes Tool Co., totaled 2,950, exceeding by 60 the previous week's 1954 record number.

The total represented an increase of nearly 150 rigs since the first of the month, and nearly 200 within the past month. It was more than 500 above the year's low number of 2,439 rigs reported running the middle of September. However, the total fell nearly 130 rigs short of equalling 1953's mid-December peak of 3,079 rigs.

Greatest increase in drilling was in the West Texas area where recent important deep-oil discoveries have given added impetus to the area's already expanding exploration and development activity. Forty additional rigs were reported running in that area during the week, as compared with the number for the previous week. These boosted the area's total to 893, a new high for the year.

A new high for the year also was set in the Arkansas-North Louisiana area, where 200 rigs were listed as active.

Total for the United States, excluding western Canada, was 2,738 rigs, also a new record for the year. Active rotary rigs are tabulated on page 171.

Mr. Gus Breaks a Leg

HOUSTON. — Rough weather, the bugaboo of offshore drilling, spoiled the first drilling operation of "Mr. Gus," the latest portable drilling platform launched in Gulf waters.

Attempting to sit down on location 17 miles east of Freeport, the Glasscock Drilling Co. platform broke a piling. It has been returned to Bethlehem Shipyards where new pilings will be designed and fitted to the platform.

The piling failure will delay drilling of a wildcat for a four-company combine for 3 months. The well was being drilled for Shell Oil Co., Pure Oil Co., Humble Oil & Refining Co. and Ohio Oil Co.

Shell's Mobile Unit Takes . . .

. . . Laboratory to Water Samples

WICHITA FALLS, Tex.—Shell Oil Co.'s new mobile water-testing laboratory goes to the sample, instead of samples coming to it.

Shell has mounted a complete portable water-treatment study lab in a house-type trailer so that analysis of water for flooding and disposal by injection can be performed on the spot. The unit has just completed a series of tests for the KMA field in Wichita and Archer counties and is working on other North Texas projects.

The mobile lab was born because Shell found that when water samples from water-flood projects were transported to a central laboratory, they formed precipitates or other changes en route. As a result, water that appeared in the lab to be suitable for injection without further treatment actually clogged the sand face in injection wells.

The most acute problem developed in Illinois operations where part of a reservoir being flooded is overlain by coal mines. Some of the wells were drilled so that they penetrated the roof-supporting pillars in existing mines. Naturally, the injection pressures have to be held to a minimum to prevent any possibility of exceeding the overburden pressure. When the injection pressures did begin to rise, it became apparent that customary lab reports of water samples did not accurately reflect field conditions.

Stripping tower . . . A converted TV antenna serves the mobile lab as a support for its scale "stripping tower." This apparatus was used in a series of tests in Illinois to determine if a sour brine could be sufficiently and economically treated for use in flooding. Results showed the hydrogen sulfide could be stripped out by a mixture of carbon dioxide and nitrogen such as exists in engine-exhaust gases. The water thus treated is suitable for flooding and is compatible with other brines available.

Independents organize for . . .

All-Out Battle Against Imports

Robert J. Enright

FORT WORTH.—Presidents of six associations of domestic producers were given a mandate here last week to begin work immediately to line up support for legislative action to curb oil imports.

Contrary to some expectations, independents at the much-publicized meeting did not unite behind a specific legislative proposal. The exact character and type of protective measure—whether tariff, quota, reciprocal agreement, or a combination of all three—will be left to Congress.

The six associations which formed a nucleus for the antiimport drive were the Independent Petroleum Association of America, Texas Independent Producers and Royalty Owners Association, North Texas Oil and Gas Association, West Central Texas Oil and Gas Association, Panhandle Producers and Royalty Owners Association, and the East Texas Oil Association.

The presidents of these groups will form a steering committee. The steering committee eventually will be broadened to include the leaders of all domestic-producer organizations over the nation who can be persuaded to go along. It will create a general committee with full authority to make the joint effort effective.

W. M. Vaughey, president of the I.P.A.A. who issued the call for the meeting, estimates all this probably will be accomplished soon after the first of the year.

About 150 of Texas' leading independent producers attended the meeting. Among the nonproducers present to lend support were Price Daniel, junior senator of Texas; Ernest O. Thompson and William J. Murray, Jr., of the Texas Railroad Commission; Jack Porter, first president of TIPRO and now Republican national committeeman from Texas; and Joe Kilgore, Nevada congressman.

Wiring support or issuing supporting statements were a sizable group of Texas and federal office holders headed by Gov. Allan Shivers and Senior Sen. Lyndon Johnson.

The resolution . . . The joint-action resolution was drawn up by the heads of the six associations during a preliminary session December 12 which lasted until well past midnight.

Oil imports, the resolution declared, have become so excessive as to "undermine the security of the United States and do serious damage to the economies of the oil-producing states and the nation.

"In consequence, we here resolve that Congress be urged immediately to use its legislative powers to reduce imports to supplemental levels.

"Acting as individuals and through our associations, we now organize ourselves to the end that the Congress will have full information upon which to base corrective action. For this purpose we extend to all concerned with the welfare of the domestic oil industry, including domestic producers of petroleum in every producing state in the nation, an invitation to join in effectuating this program.

"This security and economy of this nation, insofar as oil imports affect both, cannot safely be left to the determination of the few importing companies with a vested interest in foreign oil. The public interest makes this the responsibility of Congress.

"No material is more important to our national welfare and security than petroleum. Any world power would stand helpless without adequate oil supplies. Providing sufficient oil for our defense, and for any future emergency, must primarily be the responsibility of the petroleum industry in the United States.

"Petroleum imports have been accorded a preferential access to the domestic market. This has resulted in repeated cutbacks of production in the United States. Domestic production is no longer competitive. Importing companies have indicated plans for continuing increases in the currently excessive rate of imports.

"It shall be our objective, therefore, to:

"**. . . Encourage the building** in the United States of a strong virile domestic producing industry capable of providing an abundant supply of oil for our expanding economy, with re-

W. M. VAUGHEY
"Patience, like candle, can't burn forever."

THERE WAS NO DOZING at this 3-hour session when 150 independent producers met at Fort Worth to map a fight against oil imports. The speaker is Ernest O. Thompson, chairman of the Texas Railroad Commission. Others at the speakers table are, left to right, Lawrence Hagy of P.P.R.O.A.; Jack Woodward of TIPRO; W. M. Vaughey of I.P.A.A.; Bryan Payne of TIPRO; D. C. Norwood of N.T.O.G.A.; and P. W. Pitzer, Jr., of W.C.T.O.G.A.

serve producing capacity adequate for the defense of the nation.

". . . Prevent the increasing dependency of the United States upon oil from

WILLIAM J. MURRAY, JR.
"Fight is for welfare of entire U.S."

sources which may be inaccessible in time of war.

". . . Restore the competitive strength of the domestic petroleum industry.

"Be it therefore resolved, that we unite on a program of joint action in support of legislative action necessary to the accomplishment of a competitive tariff, tax, or other similar protective measures, the exact character and type of which to be determined by Congress in a manner to serve best our national security and economy."

Association heads participating were Vaughey; Jack Woodward, Dallas, TIPRO; D. C. Norwood, Wichita Falls, N.T.O.G.A.; Lawrence Hagy, Amarillo, P.P.R.O.A.; P. W. Pitzer, Jr., Breckenridge, W.C.T.O.G.A.; and E. J. McCurdy, Jr, E.T.O.A.

Plans discussed . . . All except TIPRO's Woodward were given full authority by their respective associations to back any course of action necessary to obtain relief.

Woodward was bound by what he termed "a strong mandate" of his association to support only an equalization tariff—a tax on imported oil high enough to erase its price advantage over domestic oil.

Arguing for the tariff, Woodward said that the quota system wouldn't be fair in that it would bar foreign oil and place domestic producers in a preferential position. The tariff, he said, would place importer and domestic producer on an equal footing.

It was suggested from the floor before a vote on the resolution that it might be well for Woodward to "go back home" and ask TIPRO to relax its mandate for the sake of unanimity.

Woodward replied that TIPRO was a fast-acting organization and if necessary could change its stand in plenty of time. If a change in TIPRO's stand becomes mandatory before its annual convention in Fort Worth March 27-29, he said, the association could be called quickly into special session.

For the present, he said, TIPRO could go along 100 per cent with the resolution as it is worded.

Reading of the resolution sparked a prolonged period of spirited discussion about the best method for obtaining legislative relief. It was overwhelmingly resolved in the end that the committee should not be precluded from pursuing any method which it might see necessary to achieve its purpose.

Plan needed . . . Senator Daniel said he had come to the meeting to hear what the producers had in mind and see what could be done in Congress to help.

He said so far it has been difficult to do anything in Congress about excessive imports because "most people in other states and their congressmen do not understand what is happening to us—that imports are ruining Texas producers and the national defense."

These people argue, he said, that we should use all the foreign oil we can while it is still available. "They don't know domestic producers are going to have to have incentives to find new oil reserves, and that we can't wait until war breaks out to provide them."

Daniel said he had tried to tell the Senate this but could advance no course of action. He could only urge, he said, that his fellow senators keep an open mind when legislation be introduced, whatever it might be. The present drive by the domestic producers, he said, should furnish this course of action.

Daniel also recommended that not only the associations in other states but the state officials be acquainted with what the domestic producers are trying to do. It's important, he said, that congressional delegations from other

SEN. PRICE DANIEL
"I came to listen."

states know that their state officials as well as their state associations are interested in this (import) problem.

Not a producer's fight . . . Vaughey, Bill Murray, and others emphasized that the drive for legislative action must not be allowed to be tagged as merely a domestic producer's fight or it would be doomed to fail.

The joint effort, Murray said, "cannot be pitched as a fight of Texas, or of independents, or of oil-producing states. It must be conducted as a fight to preserve the welfare of the entire United States. This is the gospel which must be put across."

Vaughey agreed "we wouldn't have a chance if this fight is pitched as only for the oil man and not for the consumer."

Report awaited . . . The cabinet committee appointed by the President to study the national fuel-supply situation and its recent but as yet confidential report to the President was mentioned often at the meeting—in various addresses, in discussion from the floor, and in the resolution itself. The latter commended the study, stating that "the industry is awaiting its results and is hopeful that the recommendations will result in a sound national program."

Thompson said he hoped that study would motivate the administration to take proper action to give relief from burdensome imports but cautioned that the report was for the President's own use and doubted if it ever would be made public.

He said it is an understatement to say foreign crude is supplanting Texas

Gulf Cuts Imports

PITTSBURGH.—Gulf Oil Corp. said last week it will cut January and February imports 4,000 bbl. daily below the November-December daily average of 133,000 bbl.

The cut will be a reduction of 15,000 bbl. below planned imports for the first two months of 1955, Gulf said. It will extend the period of import reduction made by the company last June when it announced a 10 per cent cut in imports for the second half of 1954.

The action means Gulf will increase its purchases of domestic crude by 15,000 bbl. to a total of 170,000 bbl. daily, 36 per cent more than its imports, Gulf said.

REP. JOE KILGORE
"We'll back Texas . . . ."

production and that it is a mistake to rely too much on foreign oil which could be cut off overnight in event of war. The present rallying of domestic producers against excessive imports, he said, could not have been more timely.

Vaughey said that it is encouraging that "consideration is coming from the administration—something we have not been used to for some time." The only permanent solution to the import problem, notwithstanding the cabinet committee report, however, "is through the congressional route," he said.

Delhi, Taylor Reach Terms

DALLAS.—Officers of both Delhi Oil Corp. and Taylor Oil & Gas Co. have agreed on terms for merging the two firms.

Under the agreement, stockholders reportedly will exchange 100 shares of Taylor stock for 137 shares of Delhi, and Delhi's present 45 per cent interest in Taylor will be cancelled.

The name of the new firm will be Delhi-Taylor Oil Co.

Consolidation terms already have been approved by the directors of Delhi, and the Taylor board is expected to act on the proposition immediately. If Taylor directors also approve the agreement, the transaction is expected to be submitted to stockholders of both firms sometime in January.

Taylor Oil & Gas had a net income of $2,391,813 during the fiscal year ended June 30. Total assets at that time were $36,286,510. Delhi reported a 1953 loss of $690,142, which the company said was due to dry-hole costs incurred during an extensive exploration program. Operating income of Delhi was placed at $4,106,206 in this report.

Schools Get Boost

Jersey Standard sets wide pattern for college grants

NEW YORK.—Corporate aid to education got a boost this week when Standard Oil Co. (N.J.) announced a broad program of contributions to 138 privately supported colleges and universities.

The aid to the colleges totals $450,000, and another $50,000 is being given to the Fund for Medical Education. This brings to $1,000,000 the grants to education in the United States by Jersey Standard and its affiliate companies in 1954.

The precedent-setting feature of Jersey Standard's action was in the widespread, general character of the grants and also in the fact that the money goes into the operating funds of the colleges for use in undergraduate education with no strings attached. The company's contribution can be used for new classroom furniture, professors' salaries, scholarships, or whatever the college decides.

Along with many other corporations, Jersey Standard has for years made grants to educational institutions for projects directly connected with its business operations, for example, phases of petroleum research. However, as Eugene Holman, Jersey Standard board chairman, explained, the needs of colleges and universities are growing, and the company has for some time felt that it would be desirable to give financial support to general higher education at the undergraduate level.

Court test . . . The right of companies to give to colleges for specific purposes connected with company business has been established, but before last year, there was some question about the legality of unrestricted, general grants, at least insofar as a New Jersey corporation was concerned.

To settle the question, a test case was arranged in New Jersey in which a stockholder brought suit against a New Jersey manufacturing company which had given $1,500 to Princeton University. The state Appeals Court held that reasonable grants of this nature were legitimate prerogatives of management.

The largest contribution made by Jersey Standard to any one of the 138 institutions was $5,000. All are private schools, though some have partial state assistance. Holman said the grants were in the nature of an experiment in which the company hoped to gain further experience as a guide to future policy in making educational contributions

Jersey company officials hope that the policy will be picked up and followed by companies in oil and other industries. The company's 1954 contributions were spread among a fairly large number of institutions with a necessarily modest sum to any one of them. The over-all needs of higher education are such that they can be met only by efforts of the institutions themselves, alumni, industry, and other private agencies and individuals, Holman said.

Industry Briefs

AUSTIN.—The field price for Texas Panhandle natural gas has increased about 15 per cent during the past year, according to a Texas Railroad Commission survey. Gas sold at 14.65-pound pressure is currently bringing 8.1513 cents per M.c.f. compared with 7.0906 cents last year. The price for gas sold at 16.4 pounds pressure has jumped from 7.9376 cents per M.c.f. to 9.125 cents.

CHICAGO.—Pure Oil Co. and Texas & Pacific Coal & Oil Co., Fort Worth, have signed an exploratory agreement covering areas in Alberta, British Columbia, Manitoba, and Saskatchewan. The joint Canadian operations will be directed from Calgary.

AUSTIN.—The Texas Co. revealed last week that it plans to create a 200,000-bbl. cavity in the Sour Lake salt dome of Hardin County in the Texas Gulf Coast for storage of L.P.G. products from its Port Arthur refinery. Texaco applied last week for Texas Railroad Commission approval to proceed with the project.

LOS ANGELES. — Richfield Oil Corp. has started building an airstrip on Santa Cruz Island as its first step in drilling an exploratory test on the 22-mile long island, 22 miles offshore from Santa Barbara. The airstrip will be used principally to transport personnel and some supplies to the western end of the island, where the company has a 54,000-acre lease. Equipment for the island's first test, a 10,000-ft. rig, will be barged to Santa Cruz. Drilling is expected to start about the first of the year.

CALGARY. — D'Arcy Exploration Co., Ltd., a wholly owned subsidiary of Anglo-Iranian Oil Co., Ltd., is increasing its holdings in Triad Oil Co., Ltd., to a 50 per cent interest through exercise of a 1953 option. E. H. Tanner, Triad president, said the transaction will ultimately increase D'Arcy's investment in Triad to approximately $19,500,000.

Trunk Line Approved

. . . But problem of getting gas from fields to main line still faces gathering system for big Trans-Canada line

CALGARY.—Construction of the main trunk line to gather gas in Alberta for the proposed Trans-Canada Pipe Lines, Ltd., has been approved, but a $20 million question remains unanswered—who will build feeder lines from gas fields to main gathering line.

This question was expected to be answered when Alberta Gas Trunk Line, Ltd., appeared before the Alberta Petroleum and Natural Gas Conservation Board. Approval to build the 315-mile trunk line was granted, but the feeder system is still up in the air.

A decision on the feeder system will be made soon—probably within 6 weeks. Alberta Gas Trunk Line's provisional board announced at the conservation board hearings that it has decided to leave a decision on the feeder system up to a permanent board, which will be named soon.

Settling the feeder-system question will enable the trunk line to set a total rate it will charge producers to move gas through the line. The company has quoted a rate averaging about 3.313 cents per M.c.f., but this figure does not include feeder-line costs.

Determining the gathering charges also is a key step in Trans-Canada's drive to complete purchase contracts with producers. Trans-Canada has made a firm bid of 14 cents per M.c.f. for gas delivered to the Alberta border and western terminus of the big-inch line, but producers are holding back until they learn what the gathering costs will be.

The delay in the feeder-system question makes it almost certain that Trans-Canada will not be able to meet a December 31 deadline set by the Canadian Government to complete financing arrangements for the 2,200-mile line. However, an extension of this deadline is expected.

The problem . . . Getting the gas from the fields to Alberta Gas Trunk Line's main line will involve several feeder lines costing about $20 million. The cost of linking Pincher Creek field in southwest Alberta will be an estimated $9.5 million.

An extensive feeder system also will be necessary to connect Provost field and adjacent fields in eastern Alberta to the trunk line. There are about 15 fields currently slated to furnish gas for the line.

Construction schedule . . . The trunk line will be built in three stages starting at the connecting point with Trans-Canada and working west and north to the terminus at the south part of Bonnie Glen field. The construction will cover 3 years, from 1955 to 1957.

The first stage will include 5.6 miles of line from the Alberta-Saskatchewan border to the South Saskatchewan River and 68.7 miles of line on west. This section will enable Trans-Canada to meet delivery schedules to Winnipeg and the Minneapolis market by late 1955.

The second leg of construction will extend the trunk line an additional 31.7 miles west to Bassano. This construction will tie in with Trans-Canada's plans to serve the Toronto area in 1956.

The final leg includes 208.5 miles of pipe running from Bassano to a point about 10 miles northeast of Calgary and north to Bonnie Glen field. Montreal is slated to receive Trans-Canada gas in 1957, which will be the completion date for the final leg.

The size of the trunk line will range in diameter from 18 to 36 in.

Pembina Wells Completed

CALGARY.—Stanolind Oil & Gas Co. has completed two good producers in Pembina field, further evaluating the company's nine-section "F" lease in the rapidly growing Alberta reservoir.

Stanolind and Hudson's Bay F-8 Pembina Crown tested for a potential of 1,030 bbl. of oil per day, one of the biggest gages yet recorded in the field. The test was conducted through 48/64-in. choke for 14 hours, with recorded flow of 593 bbl. of 38°-gravity oil. Well was completed at total depth of 5,260 ft. in the Cardium, topped at 5,191 ft. The F-8 is located in LSD 6, 27-47-8w5. It extends Cardium production ½ mile to the south.

Stanolind-Hudson's Bay F-7 Pembina Crown was completed for 359 bbl. of 38°-gravity oil per day on 25/64-in. choke. Total depth of the F-7 is 5,292 ft. with the Cardium found at 5,214 ft.

Crude Price Boosted

North Dakota oil to bring $2.90 a barrel January 1

TULSA. — Stanolind Oil Purchasing Co. will pay $2.90 a barrel for North Dakota crude, effective January 1.

The new posting, a 40-cent boost, will be the same as the general Mid-Continent gravity scale, with a 2-cent differential for each degree of gravity below 40.

The company said while considerable Williston basin crude is being sold below $2.90 a barrel, it is adopting the Mid-Continent scale to assure adequate future supplies for the Mandan, N. D., refinery of Standard Oil Co. (Ind.).

Before the Mandan refinery was completed, Standard purchased North Dakota crude at $2 a barrel and shipped it to its Whiting refinery by tank car at a penalty to itself, according to R. F. Pielsticker, president of Stanolind Oil Purchasing. This was done, he said, to encourage development of production to supply the future refinery.

Price protest . . . The day the Mandan refinery was completed, Stanolind Purchasing announced a top price of $2.50 for the North Dakota crude and caused an almost immediate storm of protest from producers who had hoped for the Mid-Continent price. *(The Oil and Gas Journal, October 11, page 154.)*

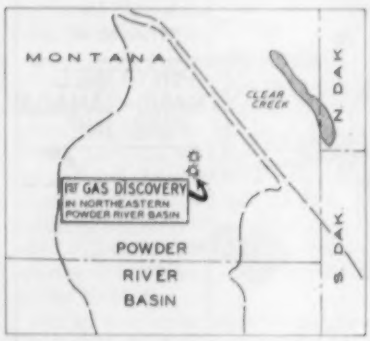
At that time, Stanolind Oil Purchasing said the $2.50 price was based on the fact that eastern Montana crude was selling at $1.42 to $2 a barrel and a new refinery is under construction at St. Paul which will market products in the same general territory, but will operate on Canadian crude priced at about $1.85 a barrel.

A. Jacobsen, president of Amerada Petroleum Corp. one of North Dakota's biggest operators, protested the $2.50 price bitterly in a prepared statement. He called the price "unfair and discriminatory," but said producers would be forced to accept it because Standard owns the only pipeline outlet for the area.

Wildcat Tests Good

DENVER.—The Denver area's new discovery well, S. D. Johnson et al 1 Pallaoro, 15 miles southwest of here, reported a recovery of 6,500 ft. of high-gravity, mud-cut oil on drill-stem tests of the zone 8,958-9,003 ft.

The zone is believed to be a stray section of the Benton (Upper Cretaceous). The wildcat is located in a faulted zone just east of the Front Range *(The Oil and Gas Journal, December 13, page 93)*. The Lyons (Permian) was hit at about 3,300 ft. above the first fault, Morrison (Jurassic) was entered at about 6,800 ft. at the second fault, and Benton shale was found at the third fault at about 8,400 ft. The operators will drill on to the Dakota objective.



Powder River Strike

Northeastern section of big basin gets first production

MILES CITY, Mont.—The northeastern portion of the vast Powder River basin of Wyoming and Montana has its first production at a gas discovery in Powder River County, Montana.

George J. Greer, Trustee 1 Allen, SW SW SE 24-1s-49e, a stratigraphic test, flowed 15,500 M.c.f. of gas per day through casing-tubing annulus. The production came from the Eagle sand (Upper Cretaceous). Total depth was 3,138 ft.

The same operator completed 2 Allen in NE SW SE 12-1s-49e, 2 miles north of the big discovery well for an initial of 175 M.c.f. per day through perforations at 2,911-17 and 2,920-24 ft. The gas is dry and mostly methane. It has a good BTU rating. Additional stratigraphic tests and development wells are planned for the area. Two dry holes previously were drilled in the discovery area.

A lease play of considerable proportions took place after first reports of a possible discovery in the rank area. This play went north into Custer County and south to the Wyoming line. Reports say that companies paid as high as $12 per acre for leases near the discovery well.

Lease Law Voided

Montana court decision restores 20-year limit

HELENA, Mont.—The Montana Supreme Court has returned to the State Land Board its authority to grant 20-year oil and gas leases on state lands.

In a 3 to 2 decision, the high court declared unconstitutional a 1953 state law providing for indefinite leasing. Under this law, leases would remain in effect for the life of oil or gas production.

The majority opinion declared the 1953 law "contrary to and in direct conflict with" the federal enabling act under which Montana was admitted to the Union. The federal act provided that certain lands be held in trust for Montana schools.

The court's decision returns Montana's leasing to a 20-year basis, under which leases are put up for rebidding after 20 years.

Effect . . . W. W. Flenniken, Denver, president of Rocky Mountain Oil and Gas Association, said the court's action will "hinder the search for new oil and gas fields in Montana."

"The decision holds invalid the type of oil and gas lease form used by all major oil-producing states, by the United States Government, and by practically all individual landowners," he added.

There were indications the case may be appealed to the U. S. Supreme Court.

No lease on state lands has been granted since the dispute arose over the 1953 law.

Profits from leasing of state lands go to public schools in Montana. In the last year of normal leasing, first-year rentals and bonuses brought the state's school districts more than $6,000,000.

Proration Bill Boosted

CASPER, Wyo.—The Rocky Mountain Oil and Gas Association will sponsor a market-demand proration bill at the January session of the Wyoming Legislature.

The proposal is being explained to oil men at meetings throughout the state, inviting possible modification and amendment of the initial draft.

The measure would create an Oil and Gas Conservation Commission which would "limit the production of oil and gas to that amount which can

be produced without waste, and which does not exceed the reasonable market demand."

The commission would have authority to regulate conservation practices at every stage of oil well development; regulate the drilling, producing, plugging, chemical treatment, spacing, secondary recovery practices of wells, and the disposal of salt water and oil field wastes; and limit and allocate the production of oil and gas from any field, pool or area.

The commission would determine what the market demand is and apportion to various pools what it considers a just and feasible proportion of total production.

Tax Appeal Likely

Court fight expected over Colorado tariff

DENVER.—Constitutionality of Colorado's severance tax on oil and gas production is expected to be tested by The California Co.

Likelihood of a court test became apparent when the state revenue department's income tax division denied a claim by the company for a refund of $955,238 in severance taxes paid on 1953 production.

The firm now has the right to appeal to the state revenue director and, if unsuccessful there, may carry its protest to District Court. The controversy eventually may go to the Colorado Supreme Court.

The California Co., principal producer in the Rangely area of western Colorado, contends the levy represents double taxation. Counsel for the company argued that the state cannot tax production from oil and gas leases on federal lands, such as the firm has in the Rangely field.

Additional protests filed by other companies still are being considered by the department. Taxes paid under protest by all companies amounted to $1,827,061 at the close of the fiscal year July 1. Colorado collected $2,589,000 in severance taxes on oil and gas during that fiscal year.

Gasoline Plant to Close

LUSK, Wyo.—Lance Creek gasoline plant operated by Continental Oil Co. will be shut down December 31 after 17 years of operation.

Large-scale water flooding of the basal Sundance sand will be started soon, necessitating a sharp reduction in gas produced from the sand.

The plant is owned by Continental, Argo Oil Co., and Ohio Oil Co.

Gas Line Proposed

Project would give Denver new supply from northeast

COLORADO SPRINGS.—Natural Gas Producers, Inc., is seeking authority to construct a 48.7-mile, 10-in. pipeline which would give the Denver metropolitan area its first gas service from northeastern Colorado fields.

The firm, a wholly owned subsidiary of Colorado Interstate Gas Co., also has applied to the Colorado Public Utilities Commisison for a certificate to build pipeline facilities serving Fort Morgan and Brush, Colo. The entire project would involve about 61 miles of pipeline and would cost an estimated $1,374,000.

The main line would link Adena, Fort Morgan, Little Beaver, Badger Creek, and Bobcat fields with Colorado Interstate's main system extending from the Hugoton field to Denver. In addition, the company proposes 3 miles of 8-in. and 10 miles of 4-in. line which, with an existing line, would link the Adena field with Fort Morgan and Brush.

Approximately 325 oil wells are producing in northeastern Colorado and gas in varying amounts is being flared.

Operators in Little Beaver and Adena fields have entered into agreement for the construction of gasoline plants to process gas.

WEST COAST

Tacoma Refinery Planned

TACOMA, Wash.—Construction on the 10,000-bbl. refinery planned by Pacific Oil & Refining Co. near here may be started before next June.

Dredging operations to the site in the Tacoma mud flats have been started. If the plant is completed as planned, it will operate on Canadian crude tankered to the site from Trans Mountain Oil Pipe Line Co.'s Vancouver, B. C., terminal. The plant's output would be marketed by Time Oil Co., Los Angeles.

Ohio Works Up Deep Hole

BAKERSFIELD.—Ohio Oil Co. last week was testing possibilities for production around the 10,000-ft. level in its deep Paloma test after abandoning the lower portion of world's deepest well.

The 21,482-ft. hole, on which Ohio spent more than $2,000,000 during the more than 3 years the well has been active, now has a depth of only 10,278 ft.

Ohio set 9⅝-in. protective casing at 10,947 ft. Open hole was being carried below that depth when drill pipe was stuck just above 21,482 ft. in November 1953.

No Room for Planes at Long Beach Airport Field

Rock-bit salesmen don't need their cars in covering the concentrated drilling activity at the Long Beach Airport field. The field, which is located in the shadow of the famed Signal Hill field, currently has nine wells drilling. Eleven producers have been completed with an output of more than 9,000 bbl. daily. The five rigs in the immediate foreground—all within an area smaller than the average city block—include two owned by Hancock Oil Co., two by Termo Oil Co., and a Paulin Oil Co. rig. Another has since joined the two in the background as The Texas Co., which recorded the discovery, added a second rig.

Fishing Abandoned

Gulf plugs back deep well to test higher formation

FORT WORTH.—Gulf Oil Corp. has abandoned efforts to drill deeper at its record deep test in Reeves County, West Texas, and was plugging back at last report to test gas shows encountered at about 12,750 ft. in what was thought to be the Wolfcamp formation.

The I. P. G. Northrup, 24 miles southeast of Pecos, reached a depth of 18,609 ft. to make it the deepest well ever drilled in Texas.

A virtually impossible fishing job forced Gulf to back up 100 ft. last month and try a whipstock operation. Another tough fishing job occurred in the side-tracked hole when the drill pipe twisted off near bottom. The side-tracked hole was drilled to 18,566 ft.

A Gulf spokesman said it was believed that the well at its deepest point of penetration was in the lower Mississippian.

Gas show . . . The zone to be tested in the Wolfcamp produced roughly 250,000 cu. ft. of gas daily when tested before drilling was originally suspended in May 1953 at a depth of 16,696 ft. Gulf resumed drilling last May.

The well broke the Texas depth record in August when it passed the old mark of 17,966 ft. set in 1951 by Superior Oil Co.'s 27 Minnie S. Welder near Corpus Christi.

The deep wildcat experienced nothing but trouble, however, after September when two packers stuck in the hole during an attempted drill-stem test at the eventual total depth of 18,609 ft. All efforts to pull, washover, or otherwise remove the plugs from the hole failed. Washover pipe was lost in the hole at one time but was recovered.

The deep well is in the southeastern portion of the Delaware basin. Gulf had never announced how deep it intended to drill the well and it was thought possible that an effort might be made to go below 20,000 ft. The heavy-duty rig was reported capable of drilling to 22,000 ft. Contractor on the project was Parker Drilling Co.

Imbibition Extension Asked

AUSTIN.—Atlantic Refining Co. has asked the Texas Railroad Commission for permission to continue for another year its experimental water imbibition project in Spraberry Trend Area field.

Atlantic engineers told the commission results so far have been encouraging and that another year is needed in which to evaluate the feasibility of expanding the project.

J. R. Rhotenberry, reservoir engineer for Atlantic, testified that more than 1,100,000 bbl. of water have been injected into the Spraberry as of November 1. Injection was begun November 19, 1952. The input rate is now about 67,000 bbl. daily.

Rhotenberry said no difficulty has been encountered in injection at pressures varying from 20 to 220 psi. Injection water is now being produced in about a dozen wells. Imbibition has taken place satisfactorily, Rhotenberry said, as shown by the fact that 17 of the 26 test wells have shown large increases in oil production.

New Company Born

Mineral rights of Texas Pacific switched to TXL

DALLAS.—TXL Oil Corp., a $200,000,000 newcomer to the ranks of the operating oil industry, is officially in business.

All mineral rights not previously leased to oil firms by the Texas Pacific Land Trust were transferred to the new firm as of December 10. The unleased acreage totals 1,477,439 acres scattered throughout 29 West Texas counties from Abilene to El Paso.

The agreement transferring the mineral rights was signed by George C. Fraser, of New York, president of both the trust and the new company, and by T. J. Moroney, vice president and trust officer of the Republic National Bank of Dallas, which acted as transfer agent. George L. Burr and John K. Oliphant, Jr., also signed as cotrustees of the trust.

Initial capital stock of the new firm is 5,744,356 shares of common stock at $1 par value. The opening quotation on the New York Stock Exchange valued TXL Oil stock at $33 a share—making total market value of the securities at that date almost $190,000,000. The stock was quoted at $34.875 a share when the exchange closed December 14, raising its total value to over $200,000,000.

Stock in the new firm is held by about 6,000 certificate holders of the trust on the basis of four shares of TXL Oil for each trust certificate. The certificate holders include Lehman Corp., U. S. Smelting, Refining & Mining Co., Bear, Stearn & Co., and others. The certificate holders will retain their interest in other assets of the trust.

Transfer of the trust's mineral rights to TXL Oil was approved by interests representing 90 per cent of the certificates at a meeting in New York November 22. The vote was taken after it was determined in court in June that the transfer was legal.

Trust income last year from properties to be transferred to TXL Oil totaled $7,108,000. This was in the form of royalties on oil and gas produced by about 1,156 wells on lands leased to oil companies. The latter hold leases on about 20 per cent of the total trust acreage.

Pollution Study Offered

AUSTIN.—The Texas Board of Water Engineers has offered to conduct a thorough investigation of the alleged salt-water pollution problem in the World field area of Crockett County, West Texas, if the Texas Railroad Commission desires more information on the situation.

The commission has under advisement an application by the city of Ozona and ranchers in the World field area to require World field operators to inject salt water into a suitable underground formation rather than dispose of it in surface pits.

The complainants contended in a recent hearing before the commission *(The Oil and Gas Journal, December 13, page 97)* that improper disposal of produced salt water in World field had resulted in numerous fresh water wells within 10 to 15 miles of the field becoming salty.

The water board made its offer after hearing its chief engineer, Ivan Stout, testify that he does not believe present methods are adequate to protect fresh-water strata from seepage of brine from surface pits.

Producing Wells Sold

DALLAS.—Big West Drilling Co. has sold 40 producing wells on the Nail and Hendricks ranches in Shackelford, Throckmorton, and Haskell counties, to the Albany, Tex. partnership of Howsley and Jacobs. B. C. McMordie also of Albany, has joined them in the purchase.

Purchase price for the wells, which have a total allowable of about 150 bbl. daily, was reported in excess of $250,000. The deal included leases on roughly 25,000 acres of ranchland in the three counties.

Howsley and Jacobs own 75 per cent of the newly acquired properties and McMordie owns the remaining interest.

New Proration Method

. . . set for January hearing before Oklahoma Corporation Commission is based on producibility, demand, and costs

OKLAHOMA CITY.—A new method of proration designed to bring allowables into line with producibility, market demand, and cost factors will be given a public hearing before the Oklahoma Corporation Commission January 12-14.

The new method is part of a revision of the commission's general rules and regulations submitted by an industry committee created by the commission last spring. The draft also includes many changes, minor and major, throughout the body of the regulations. This is the first general revision since 1946, and many of the changes are to make the regulations conform to modern practice and terminology.

Semiannually the commission is to classify all pools in the state as to:

. . . **Allocated** — where the average per-well productive capacity exceeds 8 bbl. per day;

. . . **Stripper**—where the average per-well productive capacity does not exceed 8 bbl. per day, where the wells are predominately stripper or marginal, pools from which the combined daily production does not absorb an unreasonable share of the market demand for the state, pools with steady production not subject to large fluctuation, and pools in which, from an economic standpoint, the flexibility of lease-basis allowables is necessary to prevent waste.

. . . **Unit operations** and secondary-recovery operations—conducted under any plan or method approved by the commission.

In allocated pools and new pools the commisison is to determine for each proration period (normally 1 month) the amount of oil that can be produced from each pool without waste, according to factors listed in the regulations. This amounts to an MER, though this term is not used.

After deducting penalties, if any, for high gas-oil ratios, each well in an allocated pool will be assigned a top allowable. The well will be permitted to produce to this, or to its capacity, whichever is lower, in the absence of any restriction based on market demand.

Nominations are to be submitted each month by each crude purchaser (defined as the first taker from the lease tanks), stating the amount of oil desired from each common source of supply within the state. Market demand for both oil and gas will be set by the commission after a hearing, considering nominations, availability of transportation facilities, and national stocks and demand for crude and products.

After determining the market demand for Oklahoma crude, the commission will deduct:

. . . **An estimate** for new wells to be brought on production during the month;

. . . **Underage and overage** which will be made up during the month;

. . . **Production** of unit operations;

. . . **Production** of stripper fields;

. . . **Production** under discovery allowables.

The remainder will be assigned to allocated fields, adjusted by a percentage decrease below the MER. In allocated pools, allowables will be assigned on an individual-well basis and will not be transferrable among wells.

However, except for gas-oil ratio penalties, no well will be prorated by market demand below a minimum based on this depth table:

Average depth	Bbl. per day
0-2,000	10
2,000-5,000	15
5,000-8,000	25
below 8,000	35

In stripper pools, the commission will assign a per-well allowable which will not result in production of oil in excess of current market demand. This allowable will be assigned only to producing wells, but may be produced on a lease basis.

A unit operation using any flooding or pressuring method approved by the commission will be given a pool allowable on a unit or lease basis which shall not be below the minimum efficient producing rate.

Production tests must be filed on new and recompleted wells, and semiannually on all wells. No allowable will be assigned a new well unless notice of intention to drill is filed.

The proposed rules drop the mathematical formula ($Y=CDE^{ms}$) for discovery allowables adopted by the commission recently. A discovery well is defined as one that is at least 1½ miles from production. It will get a discovery allowable three times the allowable assigned to a similar well in an existing field. This will apply to other wells drilled in that field until 18 months after completion of the first well, or until six wells have been completed, or until in-fill drilling connects with another pool, whichever happens first.

Kansas Goes Deep

Two Hugoton gas strikes highlight year's activity

LIBERAL, Kans. — Exploratory success in this southwestern Kansas area has led the state in 1954. Seward County's two exploratory highlights of the year were deep pay strikes inside Hugoton Permian gas field production.

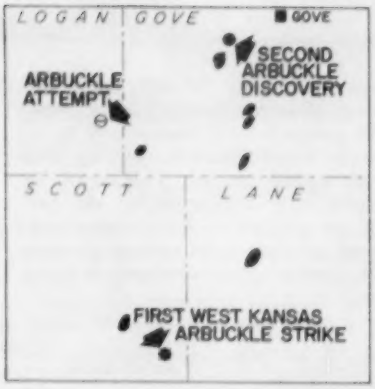
Early in the year, Cities Service Oil Co. 1 Holt "B," NW NE 28-32s-34w, opened Toronto (Pennsylvanian) gas production inside Hugoton field. The discovery flowed 17,700 M.c.f. of gas per day. Its confirmation well, a 1-mile north offset, got 15,800 M.c.f. per day.

Later Panhandle Eastern Pipeline Co. established further Toronto pay inside Hugoton at a discovery 14 miles south in 4-35s-34w. The 1-4 Boles flowed 9,700 M.c.f. of gas per day.

Another significant success was Lansekan Oil Co.'s Mississippian gas discovery, the 1-B Good in NW NW NW 20-34s-31w. This well flowed 1,700 M.c.f. of gas per day. It is 3 miles northeast of nearest Light field wells.

Prolific new oil well . . . The latest strike in Seward County is one of the best wells yet completed in Light field.

J. M. Huber Corp. 1 Neff flowed 3,117 bbl. of oil per day on 25/64-in. choke, natural. Perforations were in the Morrow (Pennsylvanian) sand at 5,962-72 ft.



New Pay Spreads

Second Arbuckle discovery assured in western Kansas

GOVE, Kans.—Western Kansas is assured a second Arbuckle discovery at a wildcat 10 miles southwest of here in Gove County.

O. A. Sutton of Wichita is installing pump equipment at 1 Ada Moore, NW NW NW 25-13s-30w. The wildcat swabbed 4½ bbl. of oil in 2 hours from perforations at 4,122-30 ft. It got ¾ bbl. per hour from 4,126-32 ft.

The discovery is in an area of depleted producers. It is 30 miles northeast of a recent Arbuckle discovery in Scott County, Hartman 1 Rush, which opened the first such pay in western Kansas. Southwest of the new Gove success Continental Oil Co. is going to test the Arbuckle at 1 Christy, SW SW SW 34-14s-32w.

This area of Arbuckle interest in western Kansas is more than 75 miles west of Central Kansas uplift Arbuckle production.

New Line Planned

Great Lakes project will serve Kansas refineries

KANSAS CITY, Mo.—A more direct outlet for products from southeastern Kansas refineries will be provided by a 10-in. pipeline to be built by Great Lakes Pipe Line Co. from El Dorado, Kans., to Kansas City.

Construction of the 162-mile line is scheduled to begin immediately. Cost of the project was not disclosed.

Initial daily capacity of the system will be 36,000 bbl. Power will be provided by a 1,080-hp. diesel-driven pumping unit at El Dorado.

The new project will supplement present transmission facilities which are considered inadequate for the indicated traffic volume from refineries at El Dorado and nearby localities.

At present, products from El Dorado are shipped eastward through an 8-in. line to Humboldt, Kans., then northeastward through the Great Lakes system to Kansas City. The new line will take a more direct route to Kansas City.

When the line is completed, the company will discontinue the uneconomic operation of four temporary secondary pumping stations on the 8-in. line to Humboldt, Moreland said. The stations were added as an emergency method of increasing capacity out of El Dorado.

NATIONAL AFFAIRS

Import Policy Hit

Study of trade agreements blasted by committee head

WASHINGTON. — Resentment over the Government's handling of the oil-import problem erupted here last week as domestic producers met in Fort Worth to plan strategy in their fight against foreign oil. *(See industry affairs.)*

A spokesman for a nationwide committee on import-export policy charged that the group's hearings on reciprocal trade agreements are simply "window dressing."

O. R. Strackbein, chairman of the group representing industry, agriculture, and labor, said hearings were designed merely to afford public expression of views by those who would be affected by tariff reductions. The charge was made before the Committee for Reciprocity Information.

Strackbein asserted that hearings by his committee supply the President with an escape from the peril-point findings of the Tariff Commission.

The responsibility to adjust tariff rates lies with Congress, Strackbein said. For the past 20 years, he added, the responsiblity has been taken over by the State Department with the result that industry no longer has an independent tribunal to which it can turn for effective relief from excessive foreign competition.

Elk Hills Line Favored

WASHINGTON. — Adequacy of Texas oil production to meet the wartime needs of both the East and West Coasts was questioned last week.

A three-man board set up by Mobilization Director Arthur S. Flemming to study the adequacy of petroleum supply on the West Coast during a period of emergency, is reported to have recommended against construction of a Texas-California crude pipeline as a defense project.

Instead, it is understood, the group favored the building of a line from California's Elk Hills Naval Reserve. The line presumably would be held in standby service for possible future need.

The board, composed of men not connected with the oil industry, raised doubts concerning the ability of the Texas industry to meet needs on the West Coast on top of the increased requirements of the industrial East in time of war.

The report is now being studied by the Office of Defense Mobilization. It covers not only the problem of transportation to the West Coast but also the availability of crude and products for military use in the Pacific and an analysis of the capacity of West Coast refineries to meet wartime requirements.

FPC Wins Round

Denver court turns down Amerada injunction plea

WASHINGTON.—For the first time since natural-gas producers began to fight back in the courts, the Federal Power Commission last week won a legal round.

The Tenth U. S. Circuit Court of Appeals at Denver refused to grant an order halting enforcement of the FPC's controversial Order 174-A when Amerada Petroleum Corp. asked for it. In three previous cases, federal courts have granted injunctions.

Commission officials regard the Denver case as significant and are quick to point out that it granted the FPC the only chance it has had to present an argument.

The first setbacks to enforcement of the order came last month when the Fifth Circuit Court of Appeals in New Orleans granted temporary injunctions against the FPC at the request of Magnolia Petroleum Co. and Ohio Oil Co. This month, the District of Columbia federal court granted the same relief to Union Producing Co. The FPC is asking the D.C. court to dismiss the action.

A number of similar suits are reportedly being prepared on much the same grounds as those already filed. In general, the FPC order is being attacked as illegal because it was issued without regard to the requirements of

the Administrative Procedure Act and the commission's own rules for notice and hearings. It is also charged the order has the effect of confiscating property without just compensation because it requires independent-gas producers to continue deliveries until the commission tells them to stop.

With the conflict in Circuit Court rulings, the issue is certain to eventually reach the Supreme Court.

Tax Cuts to Be Resisted

WASHINGTON.—President Eisenhower will ask Congress next month to continue the present 52 per cent tax rate on corporate income and existing levies on gasoline and fuel oil.

Facing a deficit which may run close to $5,000,000,000 by next June 30, the administration will resist further cuts in taxes.

Holding of taxes at their present levels was among the proposed recommendations discussed by the President in a pre-session meeting last week with congresisonal leaders. Reduction of the corporate and excise taxes, originally scheduled for last April 1 but deferred for a year, would cut $2,200,000,000 from treasury revenues.

Other proposals include increases in postal rates, increased authority to cut import tariffs, revision of the Taft-Hartley Act, increase in the minimum wage, 10-year $101,000,000,000 highway-construction program, continuation of the Small Business Administration, and continuation of the Defense Production Act.

Gas Advisory Group Named

WASHINGTON.—An advisory committee which may never be called upon for advice was appointed last week by Interior Secretary Douglas McKay.

McKay named 62 members to the Gas Industry Advisory Council for 1955. The new council, which includes only one man not on the 1954 council, is to advise McKay and the Oil and Gas Division on gas matters involving national defense. The council is purely a standby organization. It hasn't met for at least 2 years, and McKay said he had no current problems requiring its services.

Commission Approves Sale

WASHINGTON. — The Securities and Exchange Commission has approved the sale by Cities Service Co. of 51.5 per cent stock interest in Arkansas Louisiana Gas Co., Shreveport, La., for $24.5 million. W. R. Stephens Investment Co., Inc., Little Rock, is the buyer.

WATCHING WASHINGTON

Bertram F. Linz

It's a Plot, Coal Says

Importation of foreign residual fuel oil is part of a plot for division of the world oil market, Joseph E. Moody, president of the Southern Coal Producers' Association, says.

It's all part of the cartel picture, but the Government, which is prosecuting American oil companies alleged to have participated in cartel activities, at the same time is protecting the "dumping" of residual on the ground it promotes international trade, Moody charges.

This was one of a series of coal industry complaints voiced by Moody recently. Others were that coal doesn't get as good a percentage depletion allowance as do oil and gas, and that it is subject to higher railroad rates than competing fuels.

Moody isn't fighting oil and gas all the way, however. He fully supports the move to take producers of gas from under Federal Power Commission regulation. One reason is that if the Government has the authority to regulate the production of natural gas, he sees it as having the authority to regulate the production of coal, oil, lumber or any other natural resource.

The coal industry spokesman feels there is no reason for the federal Government to insist on regulating the gas industry, so that natural gas be sold at bargain prices, driving coal out of additional markets. But that has a long-range argument, too. Gas reserves, he says, are sufficient only for about 23 years and should be sold at a price commensurate with their value. When the gas is exhausted, Moody points out, consumers will have to go back to coal, but by that time the coal industry may be as dead as a dodo.

Model Compensation Act

A "model" workmen's compensation insurance act, which will be much tougher on employers than present state laws, is being written in the Department of Labor.

This interest on the part of the department indicates accident compensation will become an increasingly important issue in the state legislatures.

Forty-our state legislatures will meet next year and most of them will consider labor legislation. The department's bill will not be written in time for consideration in 1955, but the knowledge that it is being worked up may have an influence on state law-makers who do not care particularly for "model" measures originating in Washington. They may attempt to head off government pressure by reforming existing statutes before the Government gets going.

Labor observers in Washington have noted a definite trend toward stiffening compensation laws. New compensable accidents are being included, including such things as impairment of hearing for employes working close to noisy machines.

Water Supply in Danger

Despite the dire predictions of the past we aren't running out of oil. Unless something is done about it over the next few years we may be in danger of running out of water.

Water is the most immediate natural resource problem. It's a shortage in the midst of plenty, for 20 times the estimated present consumption of 73,000 billion gallons a year falls on the nation in the form of rain and snow.

It's a problem that concerns the oil industry, which uses several barrels of water for every barrel of oil it refines. In fact, there is hardly a manufacturing industry that does not use water.

The ruthless lumbering of the past and the plowing of grass lands for farming are a major cause of water shortage. Bare land bakes under the sun and rain runs off instead of soaking into the underground reservoirs. Competition for water is keen between cities, industry, plant life and evaporation.

Large sums of money are being spent by the Government and private interests on research on water recovery. Industries in arid areas, the Kuwait Oil Co. refinery on the Persian Gulf for instance, are distilling sea water. A lake has been built on the King Ranch in Texas from which the water is pumped down a deep well into a natural reservoir. Refineries and other plants are cleaning up the water they use, for re-use or discharge into streams for new use further down.

The Census Bureau will collect some statistics next year on the industrial use of water by refineries and other plants.

Human Brains Better

Electronic computers cannot replace man's gray matter, researcher tells American Institute of Chemical Engineers

George Weber

NEW YORK.—The new electronic brains aren't going to put human brains out of work.

They aren't on a par, Dr. John R. Bowman, a director of research at Mellon Institute, told the American Institute of Chemical Engineers last week at the forty-seventh annual meeting here.

"The human brain is superior to present-day computers on at least two counts," he said. "First, the brain has about 10,000 times the memory storage capacity of present-day computers. Secondly, the brain can differentiate between different tastes and between different odors, a feat beyond the capabilities of the machine. Actually, the modern computer cannot produce miracles. It is just a super slide rule or desk computer combining the practical aspects of a filing cabinet for storing knowledge, sensing elements for grasping physical conditions, and a keyboard catalog for recording all types of arithmetical units."

Dr. Bowman conceded that the new computers were much faster, about 10,000 times as fast as the human brain and did not show fatigue in the same way. He received the Professional Progress Award in Chemical Engineering for 1954 from the Celanese Corp. of America.

New techniques . . . The rapid technical progress in petroleum refining was recognized with two symposia dealing in solvent extraction and gas absorption, and in papers on catalytic reforming, alcohol synthesis, and other refining and petrochemical developments.

New research techniques attracted attention. New light on just what happens in a fluidized bed may result from a new X-ray method discussed by Dr. Edward W. Grohse of General Electric Laboratory. With an A-ray source and an X-ray detector combined in a unit that can be moved up or down over the entire height of a laboratory-scale fluidization column, researchers have been able to measure irregularities in the powder-gas mixture.

Detection and correction of such irregularities may improve operating efficiencies of cat crackers, reformers, and cokers which operate with fluidized beds.

Another research technique points to a better understanding of the atomization of jet fuels. Using the same basic method first employed to measure the speed of light, Dr. R. D. Ingebo of the Lewis Flight Propulsion Laboratory, National Advisory Committee of Aeronautics, photographed a fuel sprayer with a simple mirror rotating at high speed.

By this method engineers are able to study the high velocity atomized fuel particles in flight and determine their path, shape, and size—all important to efficient utilization of the fuel.

Orthoforming Shown

A.I.Ch.E. given details of new reforming process

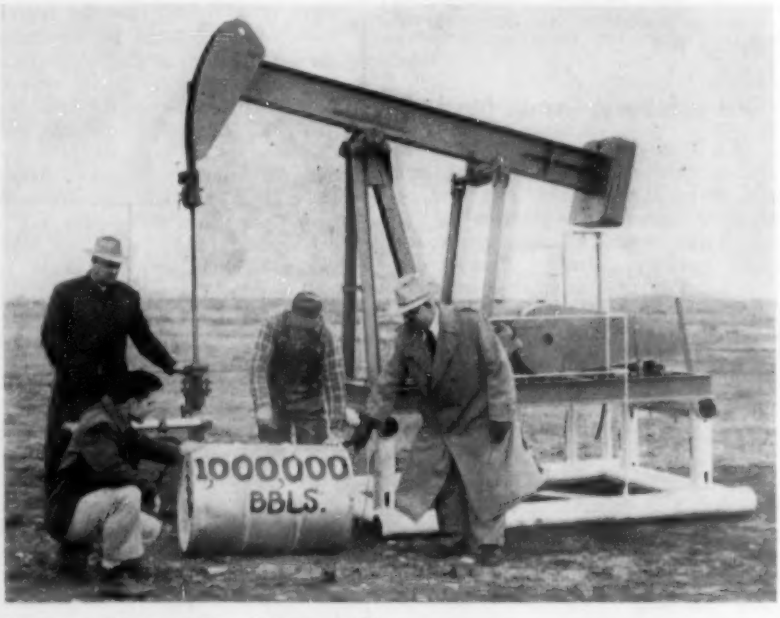
NEW YORK.—An adaptation of the Orthoflow principle to the fluid Hydroforming process has resulted in a new modification of this catalytic reforming technique.

Developed by the originators of Orthoflow, M. W. Kellogg Co., the new model process carries the obvious name of Orthoforming.

First details of this design and some operating information on the first fluid Hydroformer were revealed last week by J. C. Richards of Kellogg, at the A.I.Ch.E. annual meeting. A unit of this type will superimpose the regenerator directly over the reactor in the same column, with a common internal head separating the two.

External catalyst lines are eliminated since all catalyst circulation takes place through straight internal lines, Richards said. This minimizes turbulence, reduces erosion of metal and attrition of expensive catalyst. The location of the spent catalyst stripper within the reactor permits a higher ratio of length to diameter and increases stripping efficiency. Richards also pointed to the greater heat efficiency obtained from immersing catalyst carrier lines in the hot catalyst bed, confining heat loss to that from the vessel alone.

The catalyst . . . Richards described the manufacture of the fluid Hydroforming catalyst as impregnation of a precipitated alumina gel with a molybdenum salt solution. The material is spray-dried to form microspheroidal particles which are calcined at temperatures exceeding 1,000° F. A typical commercial catalyst will run 9-11 per cent MoO_3 and will have a particle



Kansas Water Flood Pays Off

Cities Service Oil Co. has produced its millionth barrel of oil from its shallow water-flood water-project in El Dorado field, Butler County, Kans. The project covers 21,000 acres owned by Cities Service and includes almost 400 wells. Salt water produced in the field is used in the flood. The field was discovered during World War I. The life of the field is expected to be extended 10 to 15 years by the water flooding.

density of 1.2 to 1.5 g. per cc. A Roller analysis in weight per cent will show the following representative particle size distribution:

0-20 microns	0-3
20-40 microns	8-12
40-80 microns	35-50
80+ microns	42-50

Because of its high price (60 to 80 cents per pound as compared with 6 to 19 cents per pound for fluid cracking catalyst) the Hydroforming catalyst's resistance to attrition is of particular importance, Richards said. Pilot plant studies indicated that attrition is not a serious problem. Subsequent commercial operation of the first fluid Hydroforming unit at Pan-Am Southern Corp.'s Destrehan, La., refinery have shown considerably lower attrition rates than small scale units. No apparent effect of steam on catalyst attrition or activity loss rates has been observed either.

Richards said that the first commercial unit has proven extremely flexible, ranging from 55 to 130 per cent of design throughput. It has handled naphtha feed stocks of varying boiling ranges, crude sources and naphthene-paraffin compositions. Feeds containing up to 15 per cent cracked material have also been successfully reformed.

New Developments

. . . in solvent extraction discussed for A.I.Ch.E.

NEW YORK.—Process engineers attending the annual A.I.Ch. E. meeting here last week heard some new ideas in solvent extraction methods.

A symposium on the subject featured basic research into liquid-liquid extractions, some new ideas on use of ammonia as a solvent for numerous petroleum refining steps, and the successful development of a rotating disk contactor.

The use of liquid ammonia for separation of several hydrocarbon types in refining was suggested in a paper by M. R. Fenske, director of the Petroleum Refining Laboratory, Pennsylvania State University. The solvent power of ammonia can be increased by adding a small fraction of monomethylamine, and water can be added as a good anti-solvent when ammonia solubility for a particular hydrocarbon is too high.

When properly modified to control its solvency, liquid ammonia can be used to separate aromatics from olefins, olefins from saturates, and in some cases, naphthenes from paraffins. When applied to cracked naphthas, ammonia extraction shows use in improving octane number and in separating aromatic solvents and petrochemical basics.

In upgrading catalytic cycle stocks, Dr. Fenske reported that work has been done on hydrocarbons ranging in boiling points from 0° to 1,000° F. Cycle stock separations proved relatively easy, he said. The selectivity was good, phase separation was rapid, and the solvent easily recovered.

To reduce neutralization number on a Colombian distillate, the fraction was extracted with ammonia. Feed showed a neutralization number of 1.7. This was reduced to 0.1 in the raffinate and the extract showed 8.7.

Fenske reported that the solvent system had been used on paraffinic lubricating distillates to obtain improvements in viscosity index, cleanliness, bearing corrosion and oxidation stability.

Disk contactor . . . G. H. Reman of the Royal Dutch-Shell Laboratories in Amsterdam, and R. B. Olney of Shell Development Co., Emeryville, Calif., disclosed successful commercial operation of a new rotating disk contactor in furfural extraction and extraction of a mixed chlorinated hydrocarbon feed.

The contactor consists of a vertical cylinder in which rotates a central shaft fitted with a series of circular horizontal disks. The shell is divided into identical compartments by a series of horizontal stator rings in vertical locations midway between the rotors. The outer diameter of the rotors is smaller than the inside diameter of the stators, permitting the shaft to be inserted and withdrawn.

The vessel operates in the conventional countercurrent manner. It has been thoroughly tested in large-scale commercial solvent extraction applications and has been proved to be highly efficient, simple and inexpensive to operate, and easy to maintain, the authors said. The volumetric efficiency is high, and is less expensive to build than other existing equipment of comparable efficiency.

Charcoal Adsorption Used

Standard Oil Development Co. utilizing fluidized solid technique, Fluid Char Adsorption, in separating gases

NEW YORK.—The fluidized solids technique, employing pulverized activated charcoal, is being used in separation of gases in a Standard Oil Development Co. process called Fluid Char Adsorption.

A joint paper by a five-man research team from S.O.D. and Esso Standard Oil Co. was presented last week before the annual meeting of the A.I.Ch.E. here. The authors claim many of the advantages proved in fluid catalytic cracking can be adapted to a continuous adsorption process.

One of the most interesting applications studied in developing the new process was the recovery of concentrated C_2 and C_3 fractions from refinery residue gas.

How it works . . . This latest application of fluidized solids required a departure from such operations as fluid catalytic cracking and fluid Hydroforming. Instead of a single reactor or vessel in which gas and solids mix completely it was necessary to stage the contacting in many beds. These beds were arranged as a conventional bubble cap tower. Char is admitted at the top and fresh feed near the middle of the tower and countercurrent contacting takes place on intermediate trays.

With some modifications in design of tray caps and downcomers, the engineers found that powdered charcoal behaved sufficiently like a liquid to assure satisfactory operation of the column. The heavier components of the feed gas are selectively adsorbed and carried down the tower into a desorber. There the char is heated and contacted with steam to remove the adsorbed hydrocarbons. Part of the desorbed material is returned to the bottom of the column as reflux vapor and the remainder is withdrawn as bottoms product. The lighter components go up the tower and are taken off as overhead product.

The char from the desorber section is stripped of steam with a portion of the overhead gas. It is then lifted to the top of the tower, cooled and readmitted. The process is still under development at the pilot plant level. It is believed ready for commercial application for separating feeds containing only mild deactivants. No char reactivation should be required for feeds containing no other unsaturates than ethylene propylene and acetylene and no materials heavier than C_5.

Cost studies on separation of methane and C_2 hydrocarbons from fuel gas and purification of catalytic reformer hydrogen were encouraging and indicate F.C.A. to be competitive with the best conventional processes the authors said.

Stone & Webster Engineering Corp. has been authorized to negotiate nonexclusive licenses for F.C.A.

Guatemala Stirs Oil Hopes

Private companies are interested in exploration rights if new government lowers barriers to foreign investment

Dahl M. Duff

SEVERAL companies, independents as well as majors, are ready to take a chance on Guatemala's oil prospects provided they can get acreage on satisfactory terms.

In the 5 months since the Carlos Castillo Armas group overthrew the country's Communist-dominated government in a short-lived revolution, oil-company representatives have been visiting Guatemala City to investigate the possibilities. Meanwhile, the new government has been at work on new petroleum legislation.

The draft of a proposed law worked up by a commission appointed by President Armas was recently made public. This has been rather coolly received by the interested companies.

Elmer Batzell, Washington legal consultant who was associated with the late Max Ball in drafting petroleum legislation in Turkey, was called in by the government and conferred with officials in Guatemala City. Batzell has since gone to Turkey, but company officials hope an acceptable law will eventually be placed on the statute books with his assistance.

The outlook . . . The Guatemalan Government's intentions to open the country to oil exploration were further indicated December 11 when President Armas issued a decree authorizing preliminary exploration work on a nonexclusive basis. Such action permitting surface and aerial studies is a normal preliminary to full-fledged exploration.

The decree allows preliminary exploration permits to be taken out by foreign operators or Guatemalan citizens. It repealed restrictive legislation of the Communist-oriented administration of ousted President Jacobo Arbenz Guzman.

Among the companies interested in Guatamala are Standard Oil Co. (N. J.), Richmond Oil Co. (Standard Oil Co. of California), The Texas Co., Conorada Petroleum Corp. (Continental Oil Co., Ohio Oil Co., and Amerada Petroleum Corp.), Union Oil Co., and Houston Oil Co. of Texas. Clint Murchison interests also have looked into the situation, as have other operators from the Southwest.

Guatemala has been a closed country since 1949. In that year, left-wing elements put through a highly restrictive law which made exploration by any foreign company virtually impossible. This law placed foreign companies in the status of contractors, specified that any equipment imported would become government property, and spelled out heavy fines for violation of contract terms.

Guatemala's prospects are considered reasonably attractive from a geological standpoint, but the large companies want iron-clad legal guarantees as to their future before they spend the money necessary for thorough exploration. The country has no oil production at present. The sedimentary area is the Province of El Peten in the northern section and Izabal region in eastern Guatemala.

Economic aspects . . . The El Peten section has virtually no communications with southern Guatemala, and this, coupled with tropical jungle and heavy rainfall, makes exploration work difficult and expensive. In neighboring British Honduras, a Gulf subsidiary has done seismograph work and plans to put down its first well this year.

Prior to the passage of the 1949 law, Standard Oil Co. of Ohio, Ohio Oil Co., and Atlantic Refining Co. did preliminary work in Guatemala. Atlantic Refining Co. was reported to have spent some $700,000 in Guatemala over a period of years. Standard Oil Co. (N. J.) carried out geological work in Guatemala as early as 1925, and Shell did some work there in the thirties, but they withdrew when satisfactory concession terms could not be obtained.

The 40-year-old Armas is anxious to gain the boost for the country's economy which large-scale exploration operations and possible production would bring. The president is reported determined to avoid anything hinting of monopoly, meaning presumably that the government would seek to spread the prospective acreage among as many companies as possible. Such a policy sometimes runs counter to the needs of a private company for a large block of acreage to justify its exploration investment.

A Constituent Assembly is now in session drafting a new constitution. This body has decided to ratify by two-thirds vote and on the basis of national interest, all treaties and foreign-company contracts made by Armas under his decree legislative powers. There is still strong antiforeign sentiment in Guatemala which might hold up a workable oil law indefinitely if the question is left to the Congress.

"Quite nationalistic" was the way one observer described the oil law drafted by the Armas commission. Concessions were restricted to Guatemalan nationals and companies organized in Guatemala and having boards with at least one-third of their members being Guatemalan nationals. Guatemalan companies taking concessions would have to offer publicly at least 30 per cent of initial capital in Guatemala.

The draft set up requirements for the standard exploration and exploitation concessions and also concessions for refining and transportation. The government's royalty from production was set at 16 per cent. The annual exploration-exploitation tax would be graduated from 1½ quetzales per hectare the first year to 11 quetzales per hectare, or from about 61 cents an acre to $4.45 per acre.

Exploration concessions would range from 5,000 hectares (12,400 acres) to 20,000 hectares (49,500 acres) in size. Half of this acreage could be converted to exploitation for a period of 40 years with a possible extension to 60 years.

Oil Law Drafted

Foreign companies may be invited to explore Libya

FOREIGN oil operators soon may be invited to participate in full-fledged oil exploration in the North African kingdom of Libya.

A new oil law has been drafted by a government panel and is due to be submitted to the parliament shortly after the first of the year. Prospects of early passage are reported to be good.

According to a recent report from Tripoli, the capital, the recommendations of the panel have already been placed before the Council of Ministers for approval.

Libya paved the way for the oil code with the enactment last year of a natural-resources law confirming the government's subsoil rights. Under this legislation, several large companies took out nonexclusive licenses for preliminary exploration work.

Importance . . . The country, which became independent 3 years ago under United Nations auspices, ranks as one of the world's most underdeveloped areas. The former Italian colony has

an area of about 1,100,000 sq. miles. With only 3 per cent of the land arable, the country has staggering economic problems. Any inflow of money resulting from oil operations would be important.

Companies which have indicated interest in Libya's prospects include Standard Oil Co. (N.J.); Socony-Vacuum Oil Co., Inc.; Royal Dutch-Shell; Anglo-Iranian Oil Co., Ltd.; Conorada Petroleum Corp.; and American Overseas Petroleum, Ltd. (Caltex).

The proposed legislation is reported to be generally acceptable as a basis for private foreign investment.

Provisions . . . The law would divide the country into four zones—Tripolitania, Cyrenaica north of the 28th parallel, Cyrenaica south of this line, and Fezzan. Except under special conditions, a single operator would be limited to three concessions in each of the first two zones and four concessions in each of the last two.

Acreage limitation to one operator would be 30,000 sq. km. (11,600 sq. miles) in zones 1 and 2, and 80,000 sq. km. (31,000 sq. miles) in zones 3 and 4.

The bill provides for progressive reduction of the exploration and exploitation concessions at the end of the fifth, eighth, and tenth years. It also provides a work obligation in a schedule of gradually rising minimum expenditures.

Royalty to the government is fixed at 12½ per cent, and the usual 50-50 profits split is provided after export production reaches 15,000 bbl. daily.

Rents, royalty, and taxes would apply against the government's share. When production averages more than 15,000 bbl. daily, the law would allow a depletion allowance of 25 per cent of gross income not exceeding 50 per cent of the net. An increase of up to 20 per cent in exploration and development expenses could be deducted from gross income before production reaches 15,000 bbl. daily.

Catalyst Plant Operating

The first manufacture of Platforming catalyst outside the United States has been commenced in a new plant in Great Britain.

The plant was built in little more than a year on a 10-acre site near London by Procon (Great Britain) Ltd., for Universal-Matthew Products, Ltd. Universal-Matthew is a subsidiary of Universal Oil Products Co., developers of the Platforming process, and Johnson, Matthew & Co., Ltd., London platinum refiners.

Colombian Test Fails

Richmond drops two blocks after drilling country's record hole; Ecopetrol well misses deep pay after earlier success

FAILURE of the deepest well ever drilled in Colombia has led Richmond Oil Co. (Standard Oil Co. of California) to drop two concession blocks in the Choco-Pacific area of western Colombia.

In other activity, the government company, Empresa Colombiana de Petroleos, has reportedly hit basement rock at 11,042 ft. in its deep test in the northern portion of the huge 1,000,000-plus-acre De Mares concession.

The Richmond well, Buchado 1, was taken to 15,539 ft. The two blocks surrendered by Richmond are Buchado and Bojaya, which were granted in 1952.

The Ecopetrol well obtained some production at 6,000 ft., but none was reported in the deeper Cretaceous, which was the main objective. The well encountered approximately 405 ft. net thickness of fractured oil-saturated limestone at the 6,000-ft. level. Drill-stem tests were made of the oil-saturated interval. With the packers holding only 1½ minutes, the test recovered some 250 ft. of oil-gas cut mud.

For the coming year, Ecopetrol is considering several exploration and production proposals.

Deep wildcatting . . . The large subsurface structure 15 km. north and east of Barrancabermeja (called San Silvestre) is to be drilled with the concern's new National 130 rig.

A second wildcat well is planned for the old Mugrosa structure. On this surface structure, Tropical Oil Co. has drilled four wells. One was an out-and-out dry hole, two were drilling failures, and the fourth well produced some 70,000 bbl. of 42°-A.P.I. oil in a few months' time.

Geophysical program . . . At least two seismograph crews will be employed next year. One will work southward toward the southern boundary of the concession. The second crew will detail the four reconnaissance leads developed this year in the northern area. Other promising territory for exploration may require the addition of a third crew.

Development drilling . . . Empresa Colombiana for 1955 is looking at a drilling-development program in both the proven Galan and Colorado structures. For this, Ecopetrol has three rotary rigs for use in exploitation drilling; its fourth rig is used for the wildcat work.

In Galan field, additional wells will be drilled at "straight down" locations immediately to the east of the Magdalena River, and also at "deviated" locations immediately on the east bank of the Magdalena. These latter wells are being whipstocked westward under the river.

Colorado field, Ecopterol believes, also has interesting possibilities for new drilling and hydraulic-fracturing-type completions. Some 20 locations have been made in Colorado field, which is located south of El Centro. In these 4,000-ft. locations, the sand texture is erratic but quite tight. Initial production ranges from small amounts to 2,000 bbl. per day.

Recently a new high pressure design Halliburton hydraulic fracturing pump truck was received to test the hydraulic-fracturing possibilities. If hydraulic-fracturing completions prove successful, added drilling also will be done at the San Luis structure. This large anticline runs some 40 km. in length. The producing formation consists of 40 to 50 ft. of tight oil sand, containing 38°-39° A.P.I. crude.

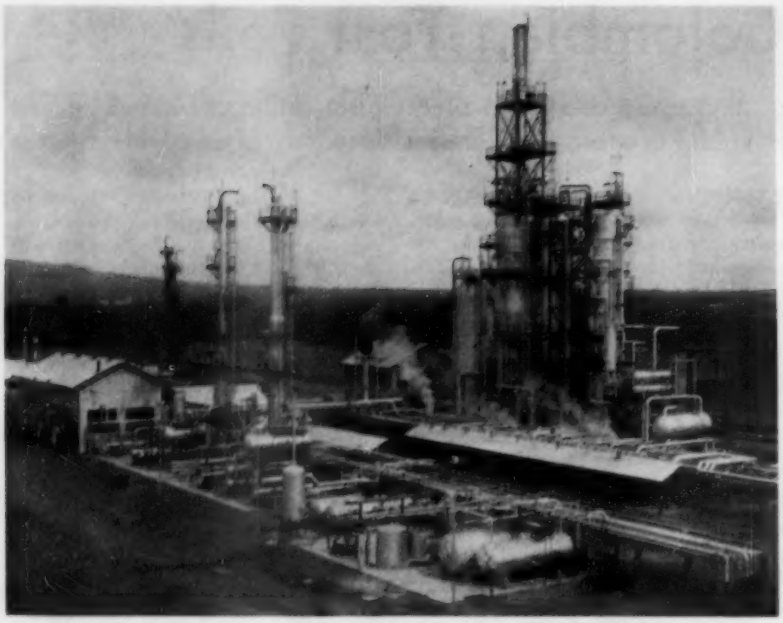
Major Work Done at Aden

All major construction work has been completed at Anglo-Iranian Oil Co., Ltd.'s Aden refinery where the first unit was brought on stream in July.

Last to be finished was the oil port which provides four jetties, each able to accommodate a 32,000-ton tanker. A total of 2,250,000 tons of rock was quarried during construction of the harbor.

The final process unit, the Autofiner for the desulfurization of tractor fuel, was to be commissioned before the end of the year. The second distillation unit of the 120,000-bbl. daily refinery, the Platformer, and other units were brought into operation earlier. *(The Oil and Gas Journal, August 16, page 109).*

The Aden plant, ranking as one of the largest refinery projects ever undertaken, was finished in just a little over 2 years. Work officially began in November 1952. Contractors were Middle East Bechtel Corp. and George Wimpey & Co., Ltd., London.



FLUID CAT CRACKING capacity of the Batangas refinery is 5,400 bbl. daily.

Philippine Plant Opens

Afflilate of Caltex completes republic's first refinery, follows trend of locating small facilities in market area

THE Philippines' first refinery has been officially opened at Batangas, 72 miles south of Manila.

The 13,000-bbl. plant belongs to Caltex (Philippines), Inc., a part of the Caltex group (Standard Oil Co. of California and The Texas Co.). The company is a major marketer of petroleum products in the republic.

The Batangas refinery reflects the postwar move toward construction of smaller refineries in the more-important consuming areas. It is one of several Far East refining projects. Australia is getting four new refineries, and one is finished and two are building in India. The latest proposal is for a refinery in Ceylon.

The new refinery has a fluid catalytic cracking capacity of 5,400 bbl. daily and a catalytic polymerization capacity of 565 bbl. daily. Vacuum distillation capacity is 7,500 bbl. daily. One of the first propane-decarbonizing units to be erected outside the United States is located at the refinery.

Speakers at the dedication stressed the importance of the refinery to the Philippine economy. The $30,000,000 project has been called the biggest single contribution by a foreign company to Philippine industrial development. Government and company officials attending the opening ceremonies included Ramon Magsaysay, Philippine president; W. F. Bramstedt, president of California Texas Oil Co., Ltd.; and H. B. Nichols, Caltex vice president in charge of refining.

The Batangas refinery will meet roughly a third of the republic's petroleum requirements, which in 1955 are estimated at more than 582,000,000 gal. or about 39,000 bbl. daily. Caltex has three major Philippine terminals, Manila, Cebu, and San Fernando, numerous marine and inland bulk plants, with others planned or under construction, and more than 300 service stations.

Exploration . . . Caltex took another important step in the Philippines last summer when its affiliated exploratory company, American Overseas Petroleum, Ltd., took out seven concessions in northern Luzon. Philippine leaders have long hoped for a well-financed exploration effort which might develop the country's first crude production. The local Philippine Oil Development Co. has been doing intermittent work in the country for a number of years. Amoseas also has signed an operating contract with this group.

Source of crude . . . In the absence of any indigenous production, Caltex has been shipping its initial supply of crude for the Batangas refinery from Central Sumatra, where the company has been producing about 40,000 bbl. daily from Minas field. The refinery, however, is designed to utilize crude from a variety of sources. Caltex also has available a large part of the Saudi Arabian production, plus a small (20 per cent) share of the output of Netherlands New Guinea.

Construction . . . Work on the Batangas refinery began in September 1952 with Foster Wheeler Corp. holding the main contract. To acquire the 299-acre site, Caltex moved several hundred houses to nearby areas. The company spent $24,000 on a six-room replacement school, and built a smaller one near the refinery.

The refinery wharf was built 1,000 ft. out into the bay to receive ocean-going tankers. Since water transportation is of first importance in the 7,000 islands making up the Philippines, practically all the refinery's output is moved by barges and the company's two 700-ton, inter-island tankers.

First test runs in the crude unit were made last July, and the other process units were placed on stream in October. In preparation for the opening, Caltex last year flew 44 Filipino employes to its Pernis refinery in the Netherlands for 10-month courses in refinery operation and maintenance.

More than a fourth of the materials and equipment for the refinery came from Philippine sources. As a purely Eastern Hemisphere company, Caltex is under constant necessity of utilizing foreign currency, and various other purchases for Batangas were made in non-dollar areas. Pumps, valves, transformers, and pressure vessels came from the Netherlands.

Peru Pace Slowing

Union leaves Sechura, but Peruvian company moves in

EXPLORATION in the Sechura Desert of northwestern Peru is continuing, though on a reduced scale because of the disappointing results.

The Peruvian company, Petrolera Peruana, is making preparations to drill the next Sechura wildcat, Petrolera Peruana, representing a Peruvian group headed by A. Gildermeister, plans a test a short distance south of the Portachuelo pool in International Petroleum Co., Ltd.'s La Brea-Parinas producing property.

Union Oil Co. of California has abandoned its program in the Sechura after spending some $3,000,000 and drilling, with Santa Fe Drilling Co. as the con-

tractor, seven dry holes in rapid succession since January 7. The wells ranged from 1,282 to 5,004 ft. in depth.

Most of the acreage drilled by Union was taken over from Conorada Petroleum Corp., which took out the original concessions and then decided against participating in the Sechura play. Richmond Oil Co. earlier dropped its Sechura program after two dry holes.

Union announced in La Paz that it would continue its plans for exploration in the Montana of eastern Peru where it holds acreage jointly with the Peruvian Sullana company. In the Sechura, Sullana, which is 40 per cent owned by Union, abandoned two blocks of about 81,000 acres in the northern section. Petrolera Peruana has abandoned two concessions in the eastern Sechura totaling 116,000 acres.

In the northern coastal section of Peru, Peruvian Pacific Oil Co. (Cities Service Co. and Richfield Oil Corp.), has abandoned its third well, Tablazo 2-1, at 6,822 ft. The rig was moved to the location for Tablazo 14-1, near the northern boundary of the I.P.C. property.

In the Montana, Ganso Azul, controlled by Texas Gulf Producing Co., has begun an exploratory well to test Chonta Island.

WAPET Tries Again

Fourth failure abandoned near Australian discovery

A FIFTH attempt to extend oil production in the Rough Range area of Australia will be made by West Australian Petroleum, Pty., Ltd., which recently abandoned its fourth unsuccessful venture there.

The latest failure, Rough Range 5, went to 3,780 ft. without finding production. It was drilled about 2,100 ft. west of the discovery. The company is preparing to drill Rough Range 6, about 860 ft. southwest.

West Australian (WAPET) is still fishing at 13,059 ft. in Rough Range 1, where deeper formations were being explored. The well set off the current exploration rush in Australia in November 1953, when it tested about 550 bbl. daily of highly paraffinic crude from the interval at 3,605-20 ft. Rough Range is in the Exmouth Gulf area, about 600 miles north of Perth.

The company has two other rigs operating in Western Australia. One at Cape Range 1, was below 7,150 ft. at last report, and the other was drilling below 3,540 ft. at Grant Range 1. The Cape Range test, on a much larger structure northwest of the discovery, was reported to be dry in the formations found productive at Rough Range 1.

Australian prospects . . . George M. Cunningham, who is directing WAPET operations, pointed out recently that prospects in the Exmouth Gulf area have been dampened considerably by results since the discovery. Later, W. G. Walkley, managing director of the parent Ampol company, disagreed with the statement and said he found "no reason whatever for any discouragement over the progress of the West Australian oil search."

Cunningham said WAPET would spend another 4,000,000 Australian pounds ($9,000,000) on its program in 1955.

East Australia . . . In Queensland, in the eastern part of the continent, Lucky Strike Drilling Co.'s first Australian venture was proceeding below 5,375 ft. in a marine series of the Cretaceous. The well, located near Maryborough, is projected to a depth of 11,000 ft.

Oil Drilling & Exploration, Ltd., which is drilling the Lucky Strike well, has two other rigs in East Australia.

One recently spudded a 3,500-ft. test for Longreach Oil, Ltd., about 400 miles west of Rockhampton, in Queensland. Rockhampton is about 200 miles up the coast from Maryborough.

Oil Drilling is rigging up for a 9,000-ft. test to be drilled for Australian Oil & Gas Corp. in New South Wales. Location is at Kurrajong Heights, near Sydney.

Onassis Faces Showdown

Saudi Arabian Government and Arabian American Oil Co. plan to arbitrate tanker dispute if not settled soon

THE Arabian American Oil Co. and the Saudi Arabian Government are planning arbitration of their differences over the Onassis tanker contract unless a mutually satisfactory settlement is reached by January 15.

Aristotle Socrates Onassis, a Greek-born tanker operator, late last year worked out an agreement with the Saudi Arabian Government calling for the establishment of a Saudi-flag tanker company in return for certain preferential rights in transporting oil produced by Aramco.

The Onassis contract brought down a storm of controversy and, so far, has remained inoperative. It has been protested by a number of leading maritime countries, including the United States and Britain, as a violation of principles of freedom of commerce, and by the oil company as a violation of the terms of its concession agreement.

Onassis has found himself in trouble over the past year on various scores, some unrelated to his Saudi Arabian contract. Last month he was sued in Paris by an individual who claimed he had paid bribes to Saudi Arabian officials to negotiate the deal for Onassis. The U. S. Government brought a $20,000,000 suit against Onassis and his associates because of alleged misrepresentations in obtaining surplus American tankers, and a few weeks ago the Peruvian Government seized five Onassis whaling ships for operating within a claimed 200-mile territorial limit.

The situation . . . The Aramco concession is regarded as giving the company rights to explore for, produce, and transport oil. The Onassis contract set up a system of eligibility for tankers to engage in the Saudi Arabian trade.

Saudi Arabia has given indications that it intends to stand by the deal it made with Onassis. Early in November it rejected a British Government protest. More recently, it was reported that the Saudi Arabian Government had cleared Onassis of charges that he had traded with Israel.

The seizure of the Onassis whaling ships raised anew the question of how far a nation can extend its sovereignty into the open sea. This matter of international law is of potential effect on offshore oil exploration.

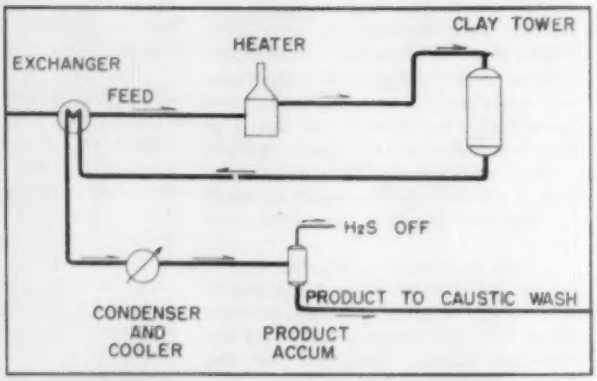
Peru seized the Onassis ships under its claim to a maritime zone extending 200 miles out from its coast. Onassis paid a $3,000,000 fine to obtain release of the vessels and was reported to have been reimbursed by Lloyd's of London, which insured the ships against seizure.

In Lima, early in December, Chile, Ecuador, and Peru, represented at what is called the South Pacific conference, claimed virtual rights of private property over a maritime zone extending 12 miles from their coasts and a lesser degree of sovereignty up to 200 miles to prohibit foreign fishing. Another recent development was a vote by the legal committee of the United Nations General Assembly instructing the International Law Commission to prepare a report on territorial waters and related problems for consideration by the General Assembly in 1956.

A Refining Process Roundup:

Here's a summary of current techniques for . . .

by L. W. Zahnstecher and C. A. Petrarca



Class 1. No H_2 recycle or makeup. Fig. 1.

. . . Achieving Catalytic

CATALYTIC desulfurization, a method for the removal of sulfur compounds from petroleum distillates, is well suited to the ever-growing need for the refiner to process high-sulfur crudes.

Under suitable conditions of temperature, pressure, and catalyst, and in a hydrogen atmosphere, organic sulfur compounds are converted preferentially to hydrogen sulfide and saturated hydrocarbons. The desulfurization process is actually a mild, selective hydrogenation wherein it is desired to obtain maximum desulfurization with minimum competing reactions, such as cracking of hydrocarbons or wasteful saturation of aromatics to naphthenes.

In general, the lighter the fraction, the simpler the desulfurization. Sulfides and mercaptans are completely desulfurized under normal operating conditions. Aromatic sulfur compounds such as thiophenes, are easier to desulfurize than polycyclic sulfur compounds. Some of the reactions proceeding during catalytic desulfurization are outlined in Table 1.

Catalytic desulfurization processes operate at a temperature of approximately 750° F., at pressures from atmospheric to 800 psi., and utilize special sulfur-resistant catalysts. The catalyst must be capable of withstanding poisoning by sulfur, nitrogen, metals, and salts, and calcining at the high temperature of regeneration. From the published data available, catalysts employed are usually oxides of cobalt and molybdenum on either an alumina or bauxite.[8 10 11]

Three Classes

Catalytic desulfurization processes may be divided into three classes:

Authors are associated with Foster Wheeler Corp., New York. Paper presented at New York section, A.I.Ch.E. fall meeting, 1954.

1. Desulfurization in the absence of hydrogen.
2. Desulfurization with hydrogen recycle to produce a hydrogen partial pressure at the reaction zone but without outside hydrogen makeup.
3. Desulfurization with both hydrogen recycle and hydrogen makeup.

The Gray process,[1] as licensed by The Texas Co., and the Perco (Cycloversion) process,[4 7] as licensed by Phillips Petroleum Co., may be listed under Class 1 (Fig. 1). Both the Perco process, operating with a bauxite catalyst, and the Gray process, operating with a fuller's earth catalyst, have had units in operation desulfurizing naphthas for many years.

This type of catalytic desulfurization is not a true selective hydrogenation in that no attempt is made to utilize an atmosphere of hydrogen for mild hydrogenation. The naphthenes are reformed to some extent and supply a small amount of hydrogen for desulfurization. When cracking the carbon-sulfur bond at low pressures, some hydrocarbons are also cracked.

These processes, while adequate for naphthas, are usually not applicable to the middle and heavier distillates due to the unstable product and the frequency of regeneration. In general, the octane number of naphthas treated by these processes is raised because of desulfurization and also because of cracking and reforming.

Sulfur reduction of from 0.69 to 0.39 per cent (weight) has been reported on a West Texas middle distillate for this class at a temperature of approximately 750° F. and a pressure of 75 psig., using a space velocity of 2.[1] The A.P.I. gravity was increased from 37.5° to 38.1° while the flash point was decreased from 160° F. to below 100° F. The 50 per cent A.S.T.M. boiling point increased from 480° to 482° F.

TABLE 1
Typical Catalytic Desulfurization Reactions

A. SULFUR COMPOUNDS

1. Mercaptans

$$C_6H_{13}SH + H_2 \rightleftarrows C_6H_{14} + H_2S$$

2. Sulfides

$$(C_3H_7)_2S + 2H_2 \rightleftarrows 2C_3H_8 + H_2S$$

3. Disulfides

$$(C_3H_7S)_2 + 3H_2 \rightleftarrows 2C_3H_8 + 2H_2S$$

4. Thiophenes

$$C_4H_4 + 4H_2 \rightleftarrows C_4H_{10} + H_2S$$

B. UNSATURATED COMPOUNDS

1. Olefins

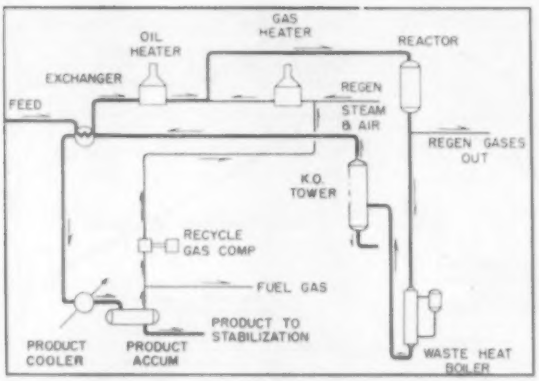
$$C_6H_{12} + H_2 \rightleftarrows C_6H_{14}$$

2. Aromatics

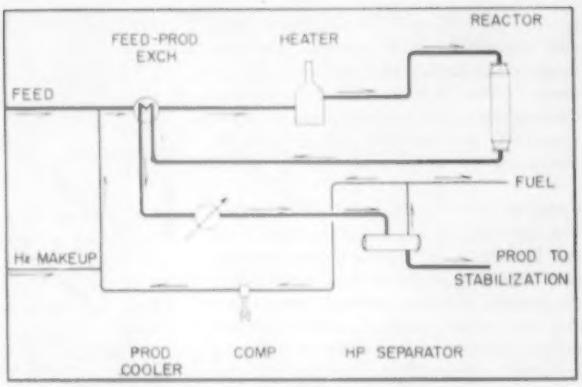
$$C_6H_6 + 3H_2 \rightleftarrows C_6H_{12}$$

Second class . . . The next real advance was made by Anglo-Iranian Oil Co., Ltd., in their development of the Autofining process,[10] an example of the second category (Fig. 2). In Autofining, the hydrogen for desulfurization is produced by reforming of the naphthenes in the feed to aromatics. This hydrogen is separated from the product stream and recycled back with the fresh feed to provide sufficient hydrogen partial pressure for desulfurization, which occurs simultaneously with reforming.

With hydrogen being produced and consumed, an equilibrium pressure of 100 to 150 lb. is established at optimum conditions. Autofining is applicable to kerosine and virgin light gas



Class 2. H_2 recycle, no makeup. Fig. 2.



Class 3. H_2 recycle and makeup. Fig. 3.

Desulfurization of Petroleum Distillates

oils when provision is made for regeneration every 200 to 800 hours. When applied to heavier gas-oil feeds, however, provision must be made for more frequent regeneration of catalyst.

When Autofining Iranian kerosine at a temperature of 780° F. and a pressure of 100 psig. with a space velocity of 5, the sulfur content was reduced from 0.180 to 0.004 per cent (weight).[16] The A.P.I. gravity of the stock was increased slightly from 45.7° to 45.8°. Other changes in this stock were an increased Saybolt color from +15 to +17 and a decrease in flash point from 126° to 106° F. The 50 per cent A.S.T.M. point remained unchanged. In this operation a hydrogen recycle of 2,000 s.c.f. per bbl was used and the product kerosine was reported doctor negative.

Class three . . . The next step in catalytic desulfurization was the introduction of a makeup stream of hydrogen to compensate for that used during desulfurization. Hydrofining,[3 15 17 18 19] licensed by Standard Oil Development Co., Hydrodesulfurization,[10 11 12] licensed by Shell Development Co., and Unifining,[2 5 8 9 13] licensed by Universal Oil Products Co. and Union Oil Co., are some examples of this last category (Fig. 3). When treating virgin stocks, even in the gas-oil range, long catalyst life is claimed and the omission of regeneration equipment is possible. The actual operating conditions are slightly different in all three cases when applied to any particular feed stock.

Reported examples of these processes are as follows: When Hydrofining (Standard Oil Development Co.) a West Texas light gas oil, the sulfur content decreased from 0.95 to 0.07 per cent (weight), A.P.I. gravity increased from 31.9° to 34.7°. The 50 per cent A.S.T.M. boiling point decreased from 580° to 570° F. and the bromine number was reduced from 11 to 3. The Robinson color increased from 9 to 19, and the diesel index increased from 49 to 56.[3]

The results of Hydrodesulfurization (Shell Development Co.) of a Kuwait gas oil were reported as follows: operating at 710° F. and 735 psig. with a space velocity of 2.4, desulfurization from 1.30 to 0.20 per cent (weight) was obtained. A.P.I. gravity increased from 35.5° to 37.7°, A.S.T.M. 50 per cent boiling point was reduced from 556° to 550° F., and the diesel index increased from 57.7 to 63.1. A catalyst life of over 8,000 hours was also reported.[11]

When Unifining (U.O.P. and Union Oil Co.) a visbreaker distillate, the sulfur content was reduced from 0.45 to 0.02 per cent (weight), A.P.I. gravity increased from 37.3° to 39.2°, and the A.S.T.M. 50 per cent boiling point decreased from 450° to 446° F. Bromine number was reduced from 45 to 3 and the A.S.T.M. color was reduced from 5 to 1 with no increase in color after 6 months' storage. Gum content was reduced from 10 to 1 mg. per 100 ml., and no increase resulted after 6 months' storage.[8]

Process Variables

The degree of desulfurization for any particular feed stock is a function of the following variables:

1. Temperature in the reaction zone.
2. Pressure of system.
3. Space velocity.
4. Hydrogen recycle rate for Classes 2 and 3.
5. Hydrogen sulfide in recycle gas for Classes 2 and 3.
6. Activity of the catalyst.

Effect of temperature . . . Published data indicate that below 650° F., little desulfurization occurs.[2 8] As the temperature in the catalyst bed increases, all other variables being held constant, the sulfur content in the liquid product decreases. Although desulfurization is adequate at temperatures above 750° F., other deleterious effects occur at high temperature, such as cracking of the feed stock, heavy coke laydown, high hydrogen consumption, and low liquid yields.

System pressure . . . Increasing the pressure from atmospheric up to 300 psi. increases the sulfur removal markedly, especially with the heavier distillates. The improvement falls off gradually above 300 psi. and unless destructive hydrogenation is desired, it usually is not economical to operate above 750 psi. due to increased capital and operating costs.[2 8]

Space velocity . . . The space velocity necessary for a given degree of desulfurization depends on the feed. Lower space velocity, in general, means more complete desulfurization. The higher the molecular weight or boiling range, the lower will be the space velocity. Excessively low space velocities will cause cracking and coke deposition.

Hydrogen recycle . . . The sulfur content of the product passes through a minimum somewhere between 2,000 and 4,000 s.c.f. per bbl. hydrogen recycle. A very low recycle rate gives a low hydrogen partial pressure and poor desulfurization. An excessively high recycle rate decreases the contact time in the reactor. The over-all effect is not very pronounced and to minimize capital investment, the recycle rate is usually held between 500 and 2,000 s.c.f. per bbl.

H_2S in recycle . . . The effect of H_2S

in the recycle gas is not very large and therefore, it is usually not economical to install H_2S removal equipment.[11] The H_2S formed by the mild hydrogenation is soluble to a slight extent in the product and it may be necessary to strip and caustic wash.

Catalyst life . . . It is difficult to predict the catalyst life based on data from the literature. In general, one can expect frequent regeneration when feeding middle distillate, perhaps once every day for those processes which operate in the absence of hydrogen. Autofining requires regeneration due to the decrease in activity with time. Operating on gas oil, the Autofining-process sulfur removal drops from 80 to 50 per cent in a 1-month period.[16]

For processes operating with hydrogen makeup on virgin distillates, catalyst life is usually over 1 year and regeneration equipment is not necessary. Spent catalyst is either sold back to the manufacturer or discarded. When operating on light catalytic cycle oil or mixtures of catalytic cycle oil and virgin stock, it may be necessary to regenerate more often than once a year and facilities for regeneration are generally provided.

Yield . . . Product yield for all processes are usually quite high, in the order of 98 to 101 per cent (volume). When feeding gas oil, most processes produce 1 to 2 per cent (volume) naphtha and no excess gas.

Economics

Local conditions, such as availability of hydrogen, type of feed, and capacity of unit, will influence the choice of process to be used in any particular case. Therefore, no effort is made to compare relative merits of individual processes. In order to arrive at a unit cost, certain operating factors were arbitrarily chosen:

1. To determine total capital investment in permanent plant facilities, a factor of 40 per cent of the "delivered and erected" contractor's price was assumed for the refiner's additional expenses in engineering, land, and outside battery-limit facilities.

2. A fixed charge of 20 per cent of total investment in plant facilities was used to capitalize the investment. This percentage is composed of the following items:

	Per cent of investment
(a) Federal taxes	6.0
(b) Profits	6.0
(c) Depreciation (12½ years)	8.0
Total	20.0

3. A fixed charge of 12 per cent is assumed on operating capital and is the sum of taxes at 6 per cent and profits at 6 per cent. Operating capital includes:

(a) Paid-up royalty.
(b) Salaries for operating personnel for 30 days.
(c) Inventory of distillate in equipment and tankage.

A. Cost of Utilities:

(a) Hydrogen taken as cost of heating value, (per M.M.B.t.u.)	$0.15
(b) Fuel gas (per M.M.B.t.u.)	0.15
(c) Steam (per 1,000 lb.)	0.40
(d) Water (per 1,000 gal.)	0.015
(e) Power (per kw.-hr.)	0.007

5. Catalyst: A 1-year life was assumed at a cost of $1.25 per lb.

6. Operating factor: An on-stream time of 320 days was assumed.

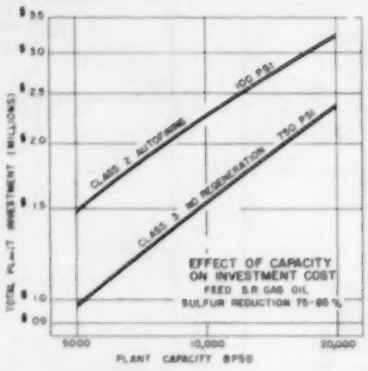


Fig. 4.

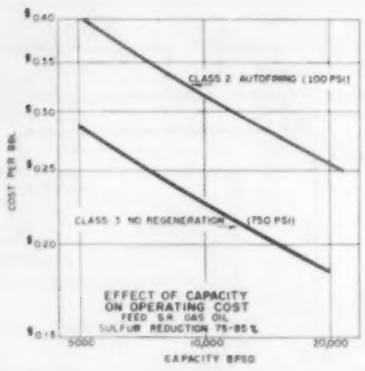


Fig. 5.

Economics Comparisons

In order to compare the economics of various classes of desulfurization, three generalized cases were chosen with arbitrarily fixed operating conditions. Details of operating conditions, utilities, plant investment and operating costs are shown in Tables 2, 3, and 4. In order to estimate the investment in operating cost for a particular feed stock, the refiner may obtain process variables from a specific licensor. The costs can be readjusted by means of Figs. 4-7.

Operating conditions for the catalytic desulfurization of straightrun gas oil

TABLE 2—SUMMARY OF PROCESS CONDITIONS

	Class 2	Class 3 nonregenerative	Class 3 regenerative
Plant specifications:			
Feed	S.R. gas oil	S.R. gas oil	Catalytic cycle oil
Capacity, barrels per stream day	10,000	10,000	10,000
Desulfurization, per cent	75	85	85
Reactor conditions:			
Reactor temperature, °F.	780	750	750
Reactor pressure, psi.	100	750	750
Hydrogen recycle, s.c.f./bbl.	2,000	1,000	2,000
Hydrogen makeup, s.c.f./bbl.	None	100	360
Liquid hourly space velocity	2.0	3.0	2.0
Utilities:			
Hydrogen, s.c.f./day	None	1,000,000	3,600,000
Steam, lb. per hour	*6,000	3,600	5,000
Water, g.p.m.	2,400	2,460	2,460
Power, kw.-hr.	1,000	460	700
Fuel gas, M.M.B.t.u./hr.	60	23	28

*Steam produced.

TABLE 3—SUMMARY OF ECONOMIC EVALUATION, 10,000 BBL. PER STREAM DAY CATALYTIC DESULFURIZATION UNITS

Investment Cost

	Class 2	Class 3 nonregenerative	Class 3 regenerative
Typical feed	S.R. gas oil	S.R. gas oil	Catalytic cycle oil
Delivered and erected cost	$1,600,000	$1,100,000	$1,500,000
Refiner's additional expense	640,000	440,000	600,000
Total investment in permanent plant facilities	$2,240,000	$1,540,000	$2,100,000
Operating capital:			
1. Royalty	$150,000	$400,000	$400,000
2. Catalyst	100,000	68,000	100,000
3. Salaries for 30 days plus inventory	123,000	99,000	99,000
Total operating capital	$373,000	$567,000	$599,000
Total investment	$2,613,000	$2,107,000	$2,699,000

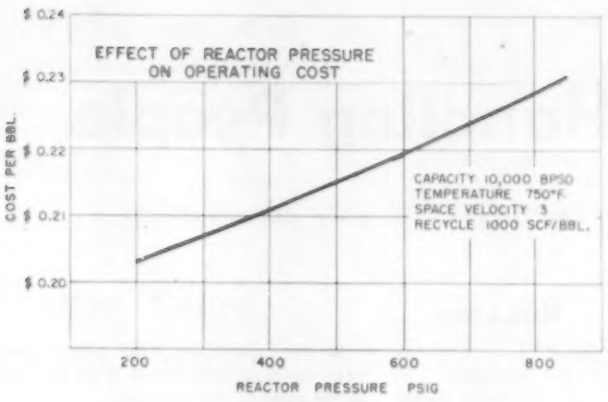


Fig. 6.

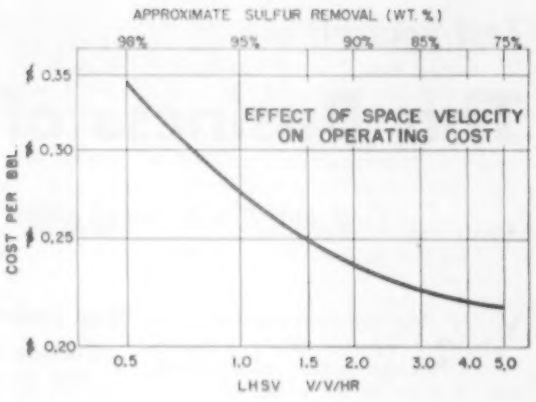


Fig. 7.

and light catalytic cycle stock are listed in Table 2.

Costs . . . Unit operating costs are tabulated in Table 4 and these vary from 23 to 32 cents per barrel. Since these figures include both profits and federal taxes, the costs given actually represent the difference between the price of the feed and the hydrogenated product.

In order to correct investment and operating cost from the standard cases of a plant capacity differing from 10,000 bbl. per stream day, Figs. 4 and 5 are included. These present investment and operating cost for plants from 5,000 to 20,000 bbl. per stream day. Fig. 6 shows the effect of pressure on operating cost. When operating pressure drops from 750 psi. to 200 psi., unit costs drop approximately 2 cents per barrel.

The effect of reactor space velocity on operating cost is illustrated in Fig. 7. The curve shows that at high space velocities, any change in space velocity affects the total operating cost to a minor degree. However, at low space velocities, a change from 1.0 to 0.5 increases the cost from 27 to 34 cents per barrel. Conditions for Fig. 7 are: nonregenerative process; reactor temperature, 750° F.; reactor pressure, 750 psig.; hydrogen recycle, 1,000 s.c.f. per bbl.; and feed, straightrun gas oil.

One further comparison may be made. This is the case where hydrogen is not available and it is desired to desulfurize gas oil for the removal of 80 per cent of the sulfur.

The refiner can install a Class 2 unit, or hydrogen production facilities from a steam-methane reformer in combination with a Class 3 type of catalytic desulfurization unit.

TABLE 4—SUMMARY OF ECONOMIC EVALUATION, 10,000 BBL. PER STREAM DAY CATALYTIC DESULFURIZATION UNITS

	Unit Operating Cost		
Typical feed	Class 2 S.R. gas oil	Class 3 nonregenerative S.R. gas oil	Class 3 regenerative Catalytic cycle oil
Annual operating costs:			
Investment in facilities at 20 per cent*	$448,000	$308,000	$420,000
Operators at $6,000	54,000	48,000	54,000
Supervisor at $8,000	8,000	8,000	8,000
Clerk at $3,000	3,000	3,000	3,000
Laboratory and administrative at 1 per cent*	23,000	15,000	21,000
Maintenance at 5 per cent*	112,000	77,000	105,000
Insurance and local taxes at 3 per cent*	68,000	46,000	63,000
Miscellaneous supplies and operating equipment at 1 per cent*	23,000	15,000	21,000
Utilities:			
Hydrogen at $0.15 per M.M.B.t.u.		13,000	48,000
Steam at $0.40 per 1,000 lb.	—18,000	11,000	15,000
Water at 0.015 per 1,000 gal.	16,000	17,000	17,000
Power at $0.007 per kw.-hr.	69,000	25,000	38,000
Fuel at $0.15 per M.M.B.t.u.	69,000	26,000	32,000
Operating capital:			
Royalty at 12 per cent†	18,000	48,000	48,000
Salaries for 30 days and inventory at 12 per cent†	14,000	12,000	12,000
Catalyst—assume 12 months' life	100,000	68,000	100,000
Total annual operating cost	$1,007,000	$740,000	$1,005,000
Unit cost, dollars per barrel	0.315	0.231	0.314

*Percentage of total investment in permanent plant facilities. †Percentage of operating capital.

TABLE 5—DESULFURIZATION OF STRAIGHTRUN GAS OIL, NO HYDROGEN AVAILABLE

	Class 2	Class 3	H_2 production	Class 3 and H_2 production
Capital investment	$2,380,000	$1,540,000	$1,000,000	$2,540,000
Unit cost, dollars per barrel	0.32	0.21	0.13	0.36

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YOUR personnel responsibilities may be more important than you realize. To see how this is true, take a quick look at some of the personnel duties you perform.

Selecting new employes
Inducting new workers
Placing new men on job
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Transferring and promoting
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Training

True, in some of your personnel responsibilities you get an assist from the personnel man or personnel department. Screening job applicants. Handling workmen's compensation, pension and insurance matters. Writing up and making available the policies of the company. Administering wages and salaries. Running special field or plant-wide services.

However, a lot of the personnel function lies right in your hands. Handling these responsibilities takes time and skill. That's why it's easy to wonder—"Is it worth it?" Successful supervisors know it is. They find they can accomplish far better results if they handle their personnel problems with special care.

Today the personnel job is big enough to include both the on-the-job experiences and first-hand employe contacts of the supervisor and the specialized skills of staff men. The alert supervisor will make the fullest use of the helps that are available to him and, at the same time, seek to improve his own personnel skills on the job.

A starting point for development in personnel skills is the Supervisor's Self-Inventory given here. It is aimed to let **you** judge where you stand now in handling your personnel responsibilities. By rating yourself accurately, you can see where you are strongest and where your performance or attitude needs improvement.

This article was taken from Management Information, a weekly bulletin of Elliott Service Co., Mount Vernon, N. Y.

Rate yourself . . . Here's how

- **Check your answer to each of the 10 basic questions here presented.**
- **Check only one statement under each question—the one which best describes your own performance.**
- **Find the score value next to answer checked and record it in the box to the right of the question.**
- **Finally, total your Self-Inventory score.**

Supervisor's Self Inventory

How Well Do I Handle

1. Do I take full responsibility for my personnel job?

- I accept most of my personnel responsibility, but I know that I could do better if I spent more time at it. [7]
- My major job is to get out the work, so I consider personnel responsibilities as mostly somebody else's job. [0]
- I fully understand my personnel duties, and do my best to carry them out. [13]

2. How careful am I in selecting and placing my employes?

- I always try to match the man with the job. [9]
- I have enough to do without worrying much about new hires. If they don't turn out well, I can always drop them. [0]
- Most of the time, I'm careful but sometimes I slip up. [6]
- I take anyone recommended to me by the personnel department or by another supervisor. [3]

3. What action do I take to develop the skills and abilities of my employes?

- I help my employes, if they ask for help. [5]
- My training effort is based on finding out what training each employe needs and applying the best method I know to develop him. [10]
- I feel that each employe should be responsible for adjusting to the job and improving his own qualifications. [0]

4. Do I periodically let my employes know where they stand?

- I only take time to tell an employe how he's getting along when he gets into trouble. [3]
- I let them figure out for themselves how they're getting along. [0]
- I consider periodic performance reviews part of my job. [9]
- When I have time enough, I go around and talk to employes about their jobs. [6]

5. How thoughtfully do I handle complaints of employes?

- I believe such cases deserve the most careful handling because they can easily grow much bigger, if poorly handled. [9]
- I do the best I can, but I never put such things ahead of getting out the work. [5]
- I don't believe in making any fuss about such cases. [0]

How did you rate?

Were you surprised at your score? Better check again to be sure you rated yourself fairly. If you scored 90 or better, that's excellent. Over 80 is very good. Over 70—good. Over 60—fair.

If you fell below 50, make sure you are being completely fair in the way you rated yourself.

To grow, follow these suggestions

Assuming you mean business and want to improve your personnel skills—here are some pointers:

1. Face up to your weak points.

It's no disgrace to be stronger in some areas than in others. But there is not much excuse for refusing to admit, even to yourself, where there's room for improvement.

2. "Bone up" on your weak points.

There are lots of excellent books on tested personnel practices. Try your public library. Or, your personnel department, if your company has one. Talk to people who seem to be doing an outstanding personnel job. Get the latest information.

3. Don't "pass the buck" on your personnel responsibilities.

You can't be an effective supervisor if you always lean on someone else to handle your personnel problems. Ask for advice or help when you need it, but take full responsibility for action that you should take yourself.

4. Make full use of staff services.

If expert knowledge and specialized experience are available, it is wasteful not to use them. Use such help to widen your understanding of personnel situations, and to strengthen your handling of them.

5. Constantly evaluate your growth in the personnel phase of your job.

Watch the reactions of your employes and of other supervisors toward you. Check records on turnover, absenteeism, grievances, safety, performance. Use this Self-Inventory again a few months from now, to check on your progress.

Today, in more and more companies, the personnel function is rated high in importance. The most highly developed machinery and equipment, the best layouts, the latest product designs—all can count for little if there is a breakdown in getting r e s u l t s through people. As never before, continued advance in our processes and products depends on skilled handling of the personnel function.

My Personnel Job?

6. *Do I consistently try to keep my employes interested in safety and good housekeeping?*

- I put output first. Safety and good housekeeping are OK, if you have time for them. [0]
- From time to time, I really clamp down on unsafe practices and poor housekeeping. [4]
- From an employe's first day in my department, I try to make him realize that safety and neatness are part of his job. [8]

7. *How careful am I in transferring and promoting employes?*

- I seldom go out of my way to move people around or to develop them for promotion. [5]
- I try to provide every employe with opportunities to work on other jobs and to advance themselves. [10]
- I only make transfers and promotions when I have to. [0]

8. *Am I consistent and fair in disciplining employes?*

- When the pressure is on, I'll be strict. [3]
- I feel that I can keep control only by "cracking down." [0]
- I usually follow the rules on disciplining. [7]
- I always try to be impartial and reasonable in handling discipline problems. [10]

9. *Do I accept my responsibility for passing on to employes, and explaining, company policies?*

- I make a point of doing this with new employes, and with all employes, when a policy is changed. [9]
- I do as much as I can but, if my production duties interfere, the policies don't get explained. [5]
- I don't make much effort to pass on policies. I leave it to others. [0]

10. *Do I regularly check on how well I am performing my personnel duties?*

- Why check up? Somebody will let you know quick enough, if you're off base. [4]
- I constantly keep an eye on the results of my handling of personnel matters. [13]
- I don't go out of my way to check on it. But if I've clearly made a mistake, I try to do better next time. [8]
- I don't know how I can check on how well I'm doing; my personnel responsibilities are too vague. [0]

TOTALS — *My score* — *Possible score* 100

BOOKS

THE A.S.M.E. PRESSURE-VESSEL CODE. By Elmer O. Bergman. Reprint of a paper presented at the A.S.M.E. eighth annual petroleum mechanical-engineering conference, September 29, 1953, Houston. Published by C. F. Braun & Co., Alhambra, Calif. 28 pp., copies free on request to publications department of publisher.

This reprint is a study of the development of safety codes for pressure vessels. It contains: (1) a summary of conditions prior to the formation of the boiler code committee in 1917; (2) the first boiler code and the evolution of the pressure-vessel code; (3) welding problems, the A.P.I.-A.S.M.E. code, and the general revision of the A.S.M.E. code; (4) an outline of present and future problems in pressure-vessel safety regulations; and (5) a comparison of the A.P.I. and A.S.M.E. codes.

The author, Dr. Bergman, has worked in research on pressure-vessel design and is currently a member of the main committee for the A.S.M.E. Boiler Code. He is staff consultant for C. F. Braun & Co., engineering contractors.

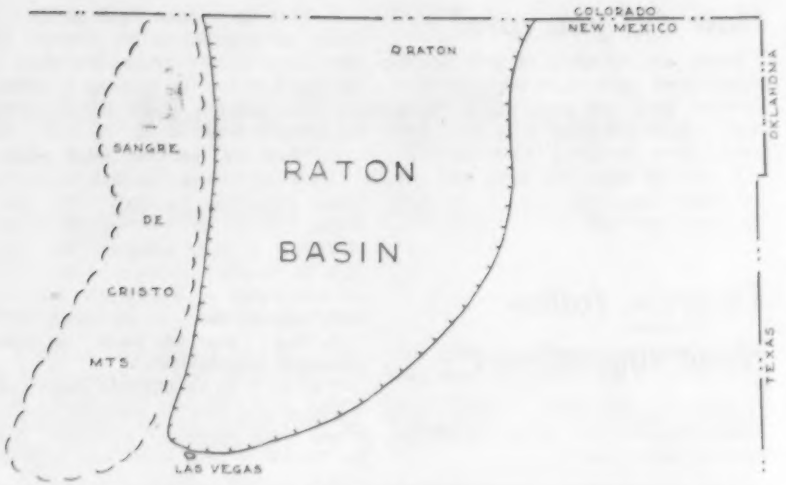
THE FUNDAMENTALS OF ELECTRIC-LOG INTERPRETATION. By M. R. J. Wyllie. Published by Academic Press, Inc., 125 East Twenty-third Street, New York 10. 126 pp., $3.60.

Here's the underlying philosophy of electric-log interpretation, written simply but fully to enable the nonspecialist worker with electric logs to appreciate the basic principles of interpretation.

The author, head of the petrophysics section of Gulf Research & Development Co., makes no attempt to teach interpretation procedures and techniques in detail. He rather concentrates on the information that will give nonspecialists a working knowledge of the applications of electric logging and the meaning of routine log readings. In so doing, he has written a text that can do much to broaden general industry understanding of this increasingly important production tool.

A Geologist Looks at Raton Basin

...and appraises the petroleum possibilities of its New Mexico portion



PROBABLE AREAL EXTENT of Raton basin in northeastern New Mexico. Fig. 1.

by H. S. Cave

THE general Raton basin area, situated in part in southern Colorado and in part in North New Mexico, is by no means one that has only recently come to be considered by geologists. First mention of the area in a published report appears to have been in the year 1821. In 1848, fossils from the area were identified as of Cretaceous age. Between 1821 and the publication of USGS Professional Paper 101 by Lea and Knowlton, no fewer than 250 published reports in some degree touched on the area. The great preponderance of all writings on the area from 1821 until the present has dealt with coal.

During recent years, however, more and more interest in the area has been related to petroleum possibilities. Various major oil companies have made at least partial evaluations of the general area during the past 28 years to the writer's personal knowledge. These companies appear largely to have just flirted with the area. They have either found little to their liking or they have felt that some new approach will be necessary before they can begin rightly to evaluate the region. Currently there is taking place a much more systematic and thorough examination of the basin.

No brief either for or against the petroleum possibilities of the area will be made here. The data that follow are at best only brief notes on possible methods of attack in interpreting the area.

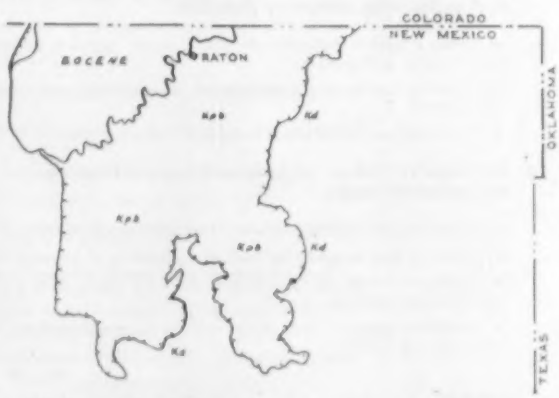
Fig. 1 shows the approximate area within the boundaries of New Mexico with which this article is concerned. The term Raton basin as related to New Mexico is actually rather vague. It will be noted that on Fig. 1 there is included an area of appreciable size lying north of the city of Las Vegas. Perhaps this latter area should be considered individually under the name Las Vegas basin. However, these two possibly distinct areas are combined here because of what appears to be a rather intimate common background of structural and stratigraphic history. What today may be a separation of the north and south portions of the general area could be the result of relatively recent crustal disturbance. The area thus outlined extends from the foothills of the Sangre de Cristo Mountains eastward up to a distance of 50 miles and from Las Vegas on the south to the state line on the north. This area comprises approximately 5,000 sq. miles.

Author is consultant geologist, Roswell, N. M.

Stratigraphy

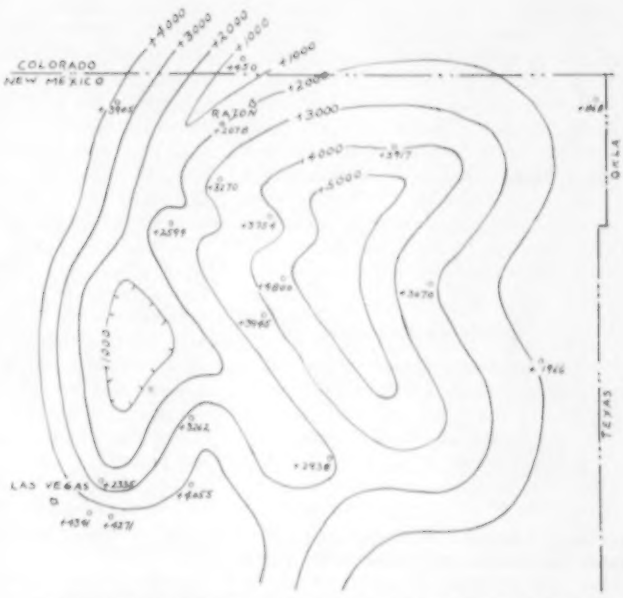
Tables 1 and 2 give the over-all columnar section as found in the general Raton basin area of New Mexico. Both charts are almost entirely based on data from the U. S. Geological Survey. Table 1 presents the portion of the geologic section best developed in the northern portion of the area. Table

"Seriously planned drilling activities are only now getting under way in the basin area. The total of all drilling in the area has neither proved nor disproved the merits of the region. Much serious work remains to be done and probably numerous test wells must be drilled before we will be in a position to know what place the Raton basin is to occupy in the world of petroleum."



AREAL DISTRIBUTION map of Eocene and Cretaceous formations in Raton basin. Fig. 2.

ONE POSSIBLE INTERPRETATION of Pennsylvanian distribution within Raton basin area. Fig. 3.



GENERALIZED regional structural picture of the Raton basin (based on control points on top of the pre-Cambrian). Fig. 4.

2 presents that portion of the generalized section best known in the Las Vegas portion of the area.

Brief descriptive notes as related to the various formational units as shown in Tables 1 and 2.

Eocene . . . The Raton formation of Eocene age consists of some 1,100 to 1,200 ft. of interbedded brown to buff sandstones and yellow to carbonaceous shales with coal.

Cretaceous . . . The Cretaceous beds, embracing the Montana and Colorado groups, are divided into the following units in descending order:

The Vermejo formation consists of some 350 to 450 ft. of interbedded, drab sandstones and shales, with coal beds. These beds appear to be of freshwater origin.

The Trinidad sandstone consists of approximately 100 ft. of light-gray feldspathic sandstone containing marine fossils.

The Pierre shale consists of some 2,000 ft. of drab to black shale with a few thin sandstone members.

The Niobrara formation is divided into the upper Apishapa shale member consisting of some 500 ft. of chalky, gray to black shale, and the lower Timpas limestone consisting of some 60 ft. of interbedded limestone and dark shale.

The Carlile shale consists of some 250 ft. of black shale, sometimes with a sandy limestone near the top.

The Greenhorn limestone consists of some 60 ft. of interbedded slabby limestone and dark shale.

The Graneros shale consists of some 150 ft. of dark-gray shale.

The Dakota sandstone and the Purgatoire formation, referred to here as the Dakota series, consists of some 175 to 225 ft. of beds predominantly of sandstone, with lesser breaks of shale and sandy shale.

Jurassic . . . The Jurassic period is represented by some 200 to 400 ft. of the variegated shales and sandstones of the Morrison formation; by approximately 20 ft. of the dense Todilto limestone; and by some 50 ft. of the white, to pink, to red, crossbedded Wingate sandstone.

Triassic . . . The Triassic period is represented by some 800 to 1,000 ft. of

TABLE 1—GENERALIZED SECTION—RATON BASIN AREA

Surface To Jurassic

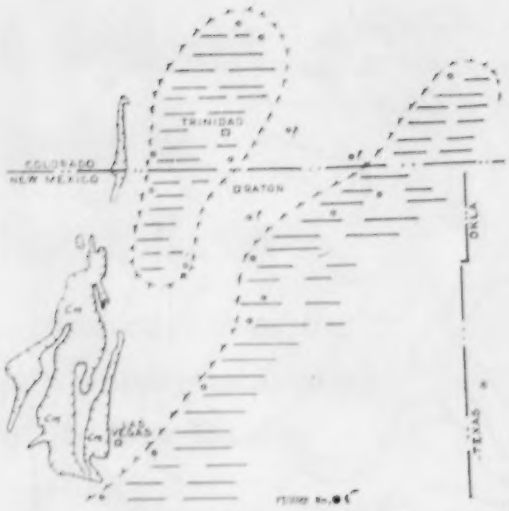
PERIOD	GROUP		FORMATION AND MEMBER	THICKNESS* FT.
EOCENE			RATON FORMATION	1150
CRETACEOUS	MONTANA		VERMEJO FORMATION	370
			TRINIDAD SANDSTONE	100
			PIERRE SHALE	2000
	COLORADO	NIOBRARA	APISHAPA SHALE	500
			TIMPAS LIMESTONE	50
			CARLILE SHALE	250
			GREENHORN LIMESTONE	60
			GRANEROS SHALE	150
			DAKOTA SANDSTONE	100
			PURGATOIRE FM.	140

*Plus or minus

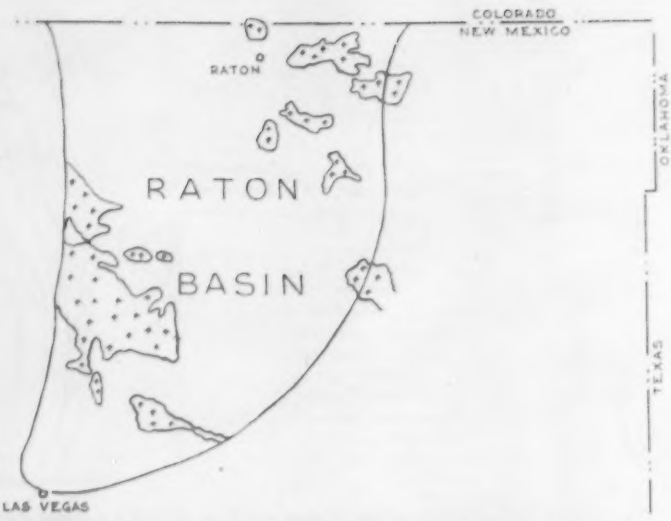
TABLE 2—GENERALIZED SECTION—LAS VEGAS AREA

Jurassic To Pre-Cambrian

PERIOD	GROUP		FORMATION AND MEMBER	THICKNESS, FT.
JURASSIC			MORRISON FORMATION	200 to 400
			TODILTO LIMESTONE	20*
			WINGATE SANDSTONE	50*
PERMIAN	DOCKUM		CHINLE FORMATION	800-1,000
			SANTA ROSA SANDSTONE	200-250
			SAN ANDRES FORMATION	75-150
			GLORIETA SANDSTONE	150-200
			YESO FORMATION	300-500
			SANGRE DE CRISTO FM.	600-1,000
PENNSYLVANIAN	MAGDALENA	MADERA LIMESTONE	ARKOSIC LS MEMBER	150
			GRAY LIMESTONE	0-300
		SANDIA FORMATION	UPPER CLASTIC MEMBER	0-250
			LOWER LIMESTONE MEMBER	0-100
PRE-CAMBRIAN			GRANITE, SCHIST, ETC.	



SECOND POSSIBLE INTERPRETATION of Pennsylvanian distribution within Raton basin. Fig. 5.



APPROXIMATE LOCATION of surface flows in Raton basin region. Fig. 6.

the red-bed type of section of the Chinle formation and by some 200 to 250 ft. of the variegated Santa Rosa sandstone.

Permian . . . The Permian is represented, in descending order, by the San Andres, Yeso, and Sangre de Cristo formations. All three units of the Permian of the Raton basin area are essentially of a red-bed character. The combined thickness of the three units ranges from approximately 1,100 to 1,850 ft. The basal portion of the Sangre de Cristo may be Pennsylvanian in age.

Pennsylvanian . . . The Pennsylvanian is represented by the Magdalena series which in turn is divisible into an upper unit known locally as the Madera limestone series and a lower member known as the Sandia formation.

The Madera is commonly divided into an upper arkosic limestone consisting of from 0 to 150 ft. of limestone, siltstone, and arkose, and the so-called gray limestone consisting of from 0 to 300 ft. of gray, cherty limestone with calcareous shale partings.

The Sandia formation is commonly divisible into the upper clastic member consisting predominantly of 0 to 250 ft. of gray sandstones and shales, and a lower limestone member consisting of from 0 to 100 ft. of gray limestone and basal clastics.

Thicknesses of the Pennsylvanian vary rapidly in relatively short distances. The greatest known thickness of the series in the general area of Las Vegas as reported to date is in the neighborhood of 2,400 ft.

The Pennsylvanian beds rest with very marked unconformity on the pre-Cambrian.

Mississippian . . . It has been suggested that beds of Mississippian age are present on outcrop in mountains just west and northwest of Las Vegas. The writer has never personally been able to find any evidence that would support such a possibility.

Summary . . . Totaling the known composite section of the entire Raton basin area as herein defined, we find that we cannot account for more than 9,500 ft. of sedimentary beds. It must also be remembered that as far as is known from currently available data, the total composite section probably cannot be expected to be present at any one place within the limits of the area under consideration.

It is not intended to give the impression that thicknesses of any of the units as set forth here may not materially exceed what are now known. Only much more extensive drilling will write the final story. However, it should be borne in mind that a very considerable portion of northeastern New Mexico appears to have been a positive, and probably emergent, area during much of Paleozoic time. With the coming of lower Pennsylvanian time, the seas appear to have spread in a generally north-south manner through the area we now know as the Sangre de Cristo Mountains. The positive mass in the extreme northeast portion of New Mexico appears to have remained essentially emergent. Hence it is entirely possible that future drilling may reveal that as related to the time of deposition of the lower Pennsylvanian beds, there may have existed only a gradual downslope from the positive mass on the east to the Cordilleran trough on the west. Such a condition could then have caused the greatest Pennsylvanian thicknesses to be present in the present Sangre de Cristo area and not in what we now call the Raton basin. In other words, it is entirely possible and perhaps quite probable that what we today call the Raton basin may never have been a major structural basin until Cretaceous and later times.

Petroleum Possibilities

The petroleum possibilities of the general area may be briefly surveyed as follows: The Raton formation of Eocene age and the Vermejo and Trinidad formations of Upper Cretaceous age (consisting of alternating shales and sandstones, with carbonaceous material) must of necessity be given some consideration as being capable of yielding oil, but are more probably better suited for gas production.

Below the Trinidad sandstone the section down to the Dakota series appears none too prospective for either oil or gas, due largely to a lack of known reservoir conditions. However, improved conditions could be present in areas that have not been made known by drilling operations.

The Dakota series appears to be by far the most prospective of the Cretaceous beds for production, both because of its over-all characteristics and by the history behind the formation in the general Rocky Mountain province. It must nevertheless be borne in mind that as far as is known currently from exposures from water wells and from a few oil tests, neither porosities nor

permeabilities are of too favorable a nature. Available data indicate that in the Raton area of the basin no more than 10 per cent pore space by volume can be expected in the Dakota sands and perhaps slightly less in the Las Vegas area.

The Jurassic, Triassic, and Permian beds, being predominantly of a red-bed type in the general area, leave much to be desired as related to the yielding of commercial quantities of either oil or gas. Many portions of these beds could well serve as reservoirs, but potential source beds appear to be extremely scarce.

The Pennsylvanian beds, primarily of Des Moines age, appear to offer by far the best possibilities for oil production of any of the Paleozoic beds within the area. In the general Magdalena series we find rocks that are capable of serving as both source beds and as reservoirs. One of the bad features of the Magdalena beds is the fact that it is difficult to follow individual units over very extensive areas. Rapid lateral facies changes are the rule rather than the exception. It is even questionable whether or not the divisions as shown on Fig. 3 are actually mappable units from one part of the basin to another.

Areal Distribution

Recognizing therefore that the Eocene, Cretaceous, and Pennsylvanian beds probably offer the greatest hope for the commercial production of oil and/or gas in the Raton basin area, it is decidedly in point to outline the approximate areas within which these various beds may be expected at depth.

Eocene and Cretaceous . . . Fig. 2 shows the outline of what may be termed the Eocene and Cretaceous area. The general west, south, and east boundaries are predicated on the limiting outcrops of the Dakota series. Within this embracing line there is an area of approximately 4,000 sq. miles. The lesser area in which the Eocene, Vermejo, and Trinidad formations occur is shown to be an area of only approximately 1,000 sq. miles. The boundary line as shown separating the Eocene-Vermejo-Trinidad beds from the overall Cretaceous area is actually the position of the relatively bold escarpment line occasioned by the outcrop of the Trinidad sandstone.

Pennsylvanian, two possibilities . . . Fig. 3 shows one possible interpretation of the distribution at depth of beds of lower Pennsylvanian age. Using control from the relatively few wells within the general area of northeastern New Mexico and extending into Colorado, it is entirely possible to show an almost complete lack of beds of lower Pennsylvanian within the major portion of the Raton basin. The area so indicated on Fig. 3 is, of course, the cross-striped portion. Assuming that the possible interpretation as shown may actually exist, the prospects for production of either oil or gas from beds of pre-Cretaceous age would be reduced to almost zero.

Before presenting a second possible interpretation for Pennsylvanian distribution, let's look at a somewhat generalized regional structural interpretation as based on control points on the top of the pre-Cambrian. This interpretation, as shown by Fig. 4, is not intended to do more than show broad regional features. It will be noted that a major high area appears to be present in the area immediately to the east of the area designated the Raton basin. The possibility of a trough area being present in the area adjacent to the city of Raton is likewise shown. Another generally low area is shown as possibly present to the north of Las Vegas.

Assuming that the interpretation as shown on Fig. 4 is essentially correct regionally, it becomes of very considerable importance as to when such a structural configuration came into being. If the interpretation as shown is Cretaceous and younger in age, we would probably be forced to attach considerable significance to the Pennsylvanian distribution possibilities as shown on Fig. 3. However, as based on the general over-all history of the area, it is entirely possible that the interpretation as shown may be cumulative and hence may have had its beginnings as far back as lower Pennsylvanian time. This latter possibility thus brings us to another lower Pennsylvanian distribution interpretation.

Fig. 5 shows Pennsylvanian distribution possibilities very different from those shown on Fig. 3. On the basis of structural interpretation as shown on Fig. 4 and on analysis of available well data, it is entirely possible that a portion of what may be termed the Rio Grande embayment of lower Pennsylvanian time may have been connected through the Raton area with the Canon City embayment of southern Colorado. The eastern limit of this potential connecting area is fairly well defined by well control. Within the central portion of the possible trough virtually no control exists. To the west, in the Sangre de Cristo area, we have Pennsylvanian outcrops. One well, the Eureka 1 Moore in 10-29n-24e, was drilled to the total depth of 4,075 ft. It will be noted that this test is near the center of the possible connecting trough. The section as revealed by the log between the depths of 3,100 and 4,075 ft. could be interpreted as the equivalent of the Pennsylvanian Fountain series of southern Colorado, or it could be considered as of lower Permian age with possible Pennsylvanian sediments at still greater depth. Assuming that the possible distribution as shown on Fig. 5 does exist, the possibilities for Pennsylvanian production in the Raton basin would be materially enhanced as compared to those under the interpretation on Fig. 3.

Structural Possibilities

Reconnaissance examinations over many portions of the basin give the impression that the structural history of the general area has been relatively simple. As a whole there appears to be little evidence indicating any particularly violent crustal disturbances. Along the western margin of the basin area considerable movement has taken place, but this area actually lies outside the region that we can rightly class as belonging in the so-called Raton basin.

Over very considerable portions of the basin there are relatively good exposures of Eocene to Cretaceous rocks. These exposures quite commonly make possible surface structural mapping on a moderately large scale. In addition, exposures in the Sangre de Cristo Mountains to the west make possible the acquisition of much data relative to the interpretation of any Pennsylvanian beds that may be found in test wells.

The general impression afforded by available exposures tends to indicate that there is generally good regional accord between present surface structural conditions and the regional interpretation as shown by Fig. 4.

It is possible that the structural history of the region may have remained relatively simple since at least the beginning of Pennsylvanian time. Certainly the relationship of Pennsylvanian and Permian beds and the pre-Cambrian beds to the west in the Sangre de Cristo Mountains could be considered as indicative of such a possibility. Again, it may develop that below the surface exposures of the Eocene and Cretaceous beds, a complex late Paleozoic history may be found.

Presently available data do not permit us to do more than speculate as to what may actually exist structurally at depth. We should, however, recognize that we do not yet have any hard and fast answers.

There is one more condition that must very definitely be taken into consideration when trying to evaluate the Raton basin. This is that igneous flow material is present over very appreciable

portions of the surface of the basin. The presence of such igneous beds adds materially to the difficulties of any type of mapping, be it geological or geophysical. Fig. 6 shows the approximate location of the surface flows in the area under consideration.

Drilling Activities

One major company is currently engaged in what is likely to be a rather extensive campaign of exploratory drilling. Prior to the current activities very few tests had ever been drilled within the limits of what is defined here as the Raton basin. Only two of these tests appear to have been drilled on any known structure. At this writing, no commercial production of either oil or gas has been reported.

Summary

There is a potential area of some 5,000 sq. miles in which it is to some degree reasonable to expect the presence of appreciable thicknesses of sedimentary beds. Some of these beds could well serve as reservoir rocks, while others could equally well have served as source beds.

The Dakota series of the Cretaceous and the Magdalena beds of the lower Pennsylvanian appear to offer the greatest hopes for commercial production of oil and/or gas as based on currently available data.

The Raton beds of Eocene age and the Vermejo and Trinidad beds of Upper Cretaceous age would appear to offer the next best hopes for production, particularly as related to gas.

The Jurassic, Triassic, and Permian beds, being predominantly of a red-bed character, and because of their position in the geologic section as related to potential source beds, appear to be of minor importance as sources for commercial production of oil and/or gas.

Two interpretations of distribution possibilities of the beds of the lower Pennsylvanian have been shown in Figs. 3 and 5. With available data a case can be made for either interpretation. The final answer may be found to lie somewhere between the two interpretations.

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REFINING POINTER

Additional Vacuum Flash Tower Increases Crude-Handling Capacity

. . . and eases load on visbreaker

by F. Lawrence Resen

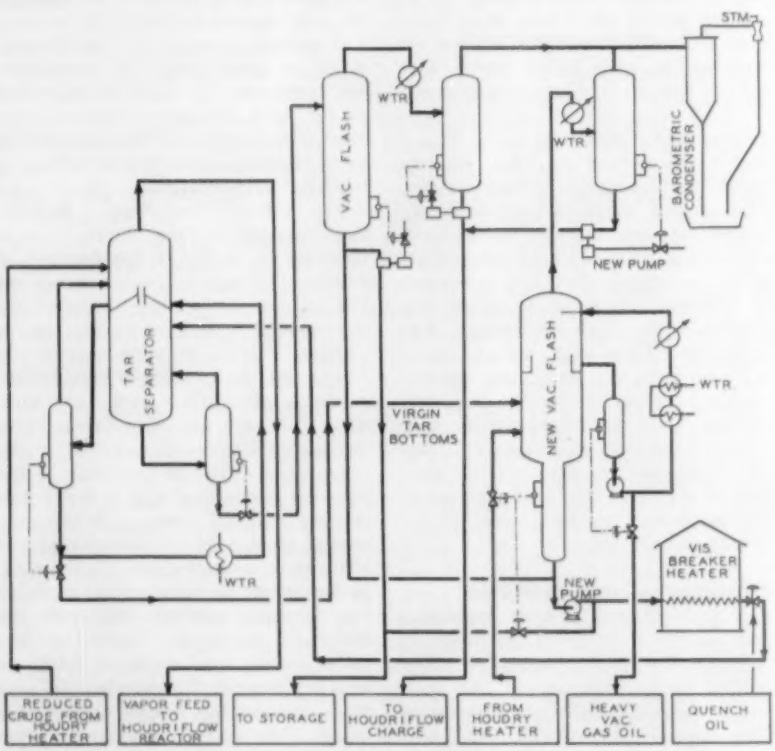
A CHANGE in the type of crude supplied to the Texas City plant of Texas City Refining, Inc., posed a serious operating problem with respect to vacuum-unit capacity and load on the visbreaker.

When the visbreaker was originally installed the plant was handling a light crude with a high gasoline and low tar content. With a shift in supply, however, a crude was purchased which yielded a greater amount of material for visbreaking.

The solution adopted was to add a second vacuum flash tower in addition to the existing tar separator and flash drum. This resulted in an increase in vacuum-unit capacity of about 6,000 bbl. per day, and has eased the load on the visbreaker. It has also permitted the crude run to the plant to be increased from 25,000 to 30,000 bbl.

In the present operation (Fig. 1) the reduced crude is heated to about 830° F. and flashed in the tar separator. Vapor goes to the Houdriflow cat cracker. Effluent from the visbreaker at about 850° F. also enters the tar separator and the vapor portion commingles with the reduced-crude vapors going to the cat cracker as vapor feed. Residual liquid withdrawn from the pan constitutes the main feed to the new flash tower. The recirculating sidestream discharges tangentially across the tar separator pan. This pumparound serves to knock down the temperature of the visbreaker material entering the separator.

The new flash-tower internals include a spray nozzle and two wire-mesh pads 4 in. thick, one located above the spray nozzles and one below the reflux pan. Tower operates at 26-in. Hg vacuum.



Cementing trucks are called in to force mud down nearly completed well when tubing parted just under well head.

Douglas Perkins, division petroleum engineer for Conoco at Lafayette, La., inspects pressure reducer on flow-line setup at discovery well.

Every deep hole a virtual "wildcat"

How They're Drilling at Rayne Field

by William P. Sterne
Gulf Coast District Editor

A BRISK drilling program is now under way by Continental Oil Co. et al. in the deep new Rayne field of Acadia Parish, South Louisiana, and although only one oil well and three gas-distillate producers have been completed from a series of deep reservoirs* four new tests are expected to increase the potential and extent of the field.

Already the operators call this field an area "where every well is practically a wildcat."

In less than 12 months, three deep holes have proved one oil sand, two gas-distillate sands; and shown good gas-distillation-production possibilities from five other sands—all below 11,000-ft. depth.

Discovered last year . . . This deep area, lying northwest of the city of Lafayette and about 2 miles northeast of the town of Rayne, was discovered in late 1953 by Conoco 1 W. Petitjean & Co., in 47-9s-2e. This wildcat took only 4 months to drill, although it was taken to a total depth of 12,755 ft., in an area which is notorious for abnormally high pressures and danger of blowouts. Originally slated as a 12,500-ft. test, the well, on December 11, 1953, was completed for a flow of 618 bbl. of 43.6°-gravity pipeline oil through perforations in the "Homeseekers C" sand, from 11,908-20 ft., plus 479,000 cu. ft. of gas, on a ¾-in. choke. Tubing pressure was 2,250 psi. and gas-oil ratio 775 to 1.

Structure . . . Rayne field was shot by seismograph crews as early as 1935. There is shallow production in several directions varying from 1 to 3 miles away, but nothing else as deep as 11,000 ft.

Information indicated that the field, an anticlinal structure, contains possibly three separate fault blocks. All of the sands indicating oil or gas-distillate production are cataloged by company geologists as being in the lower Miocene-Oligocene.

Pay zones . . . Of the three wells completed, one is an oiler, as mentioned, although it also is a potential gas-distillate producer, and the other two are gas-distillate producers. The principal pay zones of the field, as discovered to date, and in their order of depth and their indications, are as follows:

Klumpp D zone, 11,000-11,250 ft., possible gas-distillate production as indicated from recovered cores.

Klumpp E zone, 11,100-11,350 ft., possible gas-distillate production. Cores indicate good shows.

Lower Klumpp E zone, 11,200-11,500 ft., cores indicate possible gas-distillate production.

Homeseekers C zone, 11,750-12,000 ft., oil production proved.

Homeseekers D zone, 12,100-12,300 ft., electric logs show possible gas-distillate production.

Lower Homeseekers D zone, 12,300-12,450 ft., possible gas-distillate production.

Homeseekers E, 12,450-12,600 ft., producing gas-distillate.

Nodosaria sand, deepest pay, en-

*As of November 1, 1954.

countered at 13,300-13,750 ft., producing gas-distillate.

Depths vary . . . The various sands underlying the structure pinch out in different areas. Thus, each new hole drilled is, as the geologists put it, "practically a wildcat."

In some portions of the area there is the separate lower Homeseekers D sand, found between the Homeseekers D and Homeseekers E, at between 12,300 and 12,450 ft. But in other areas, this zone is difficult to identify from the Homeseekers D. At the greater depths, too, indications are that there are only two big fault blocks instead of three as indicated higher up.

Drilling pattern . . . There have been no multizone completions to date, due to the extremely high pressures encountered. Each well is slated for a particular zone, and is prepared to be completed in that zone only.

The daily allowable for the one completed oil well has been throttled back to 167 bbl. by the Louisiana conservation authorities, due to a state-wide cut in production. Therefore, with the allowable of this one well, completed as of December 11, 1953, supplemented by distillate produced with the 2,000,000 cu. ft. per day by each of the two gas-distillate wells, over-all daily production from the field is approximately 400 bbl.

About 1,000,000 cu. ft. of gas daily is utilized by each of the four steam rigs now working in the area.

Ownership . . . Continental holds a 50 per cent working interest in the field with the following partners: Sun Oil Co., Kirby Petroleum Co., General Crude Oil Co., and M. H. Marr. The 2,720-acre block held by the group was assembled by Sam E. Dunnam.

Christmas-tree hookup . . . The Nodosaria sand discovery well, the 2 W. Petitjean & Co., has an unusual christmas-tree hookup. Since the well-head flowing pressure is approximately 8,000 psi., and must be throttled down to approximately 400 psi. before the gas goes through the sales regulator on the lease, a series of five chokes have been installed between the well head and the meter.

The christmas tree, a Series 2900, is fitted with stainless-steel tubing head and master valve. Safety valves in the tubing and well head will close automatically in case of a line break. The flow line then goes through an adjustable choke, and into a positive choke. Pressure drop here is about 3,500 psi. Then the line moves through a regulator into a heater which prevents any hydrates from freezing the line. Another pressure drop occurs when the line runs through another regulator. At the separator, the pressure is by this time taken down to the 400-psi. point, where the flow enters the sales regulator.

There are four 400-bbl. storage tanks on the lease containing the discovery well. Oil is taken at regular intervals by tank truck from loading racks in the field, and it eventually enters the line of Interstate Oil Pipeline Co. for movement to the refinery.

Typical Drilling Program

Holes are usually contracted by the operator down to 10,500 ft. or to the depth at which protection casing is set. At this depth the mud is converted from red lime to oil emulsion.

Casing program . . . The following procedure has been used on the wells drilled to date:

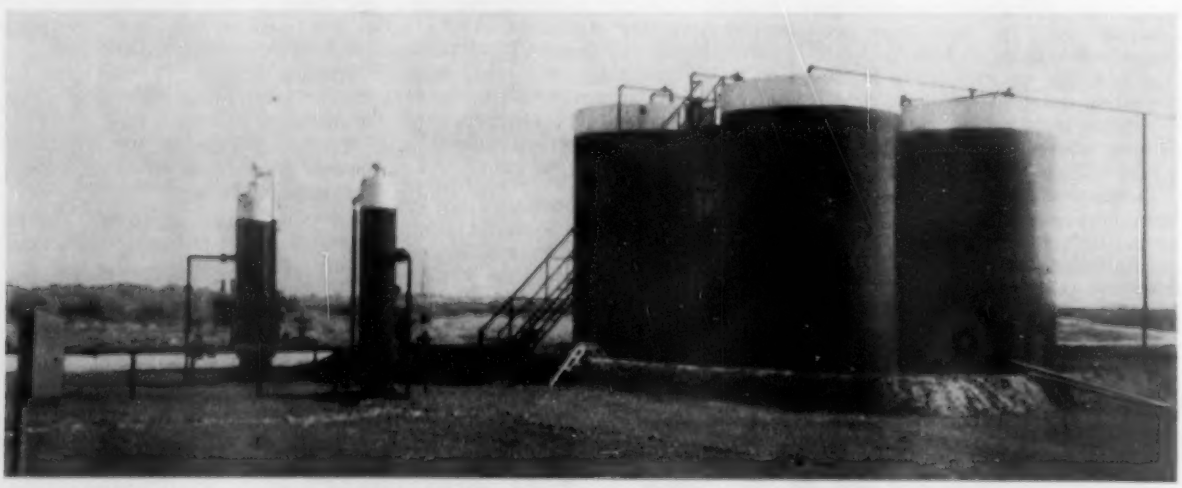
Twenty-inch conductor pipe is run to approximately 100 ft., followed by 13⅜-in. surface pipe run to 2,500 ft. Then a string of 9⅝-in. is run to 10,500 ft.; and either 7-in. or 5½-in. to total depth.

Mud . . . A typical mud program can be cited in the drilling of 2 Petitjean. Operator set 109 ft. of 20-in. with 100 sacks of cement; 2,045 ft. of 13⅜-in. with 500 sacks. When contractor drilled out from underneath, mud weight was 9.8 lb. per gallon, with a viscosity of 38.

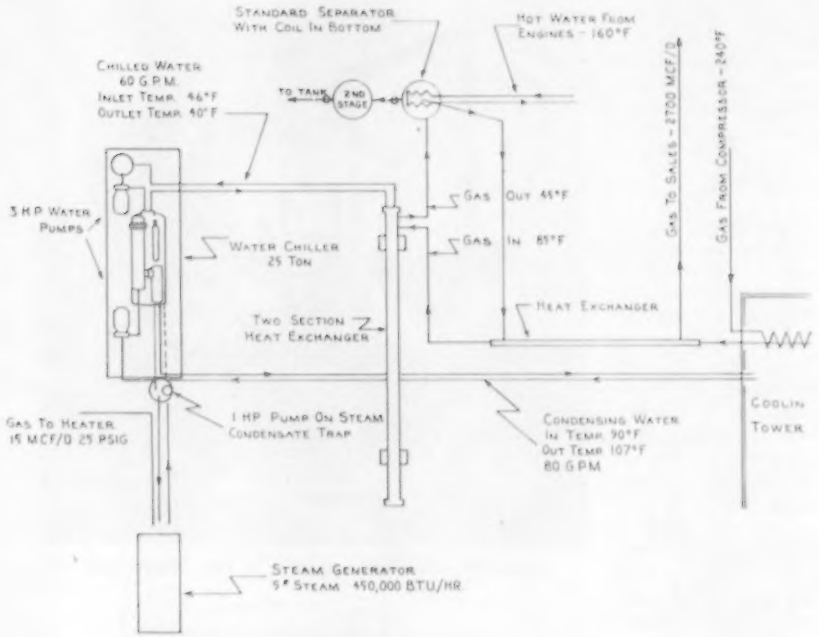
When the 9,000-ft. depth was reached, mud weight was increased to 10.1 lb., and viscosity 60. Mud weight was gradually increased from 9,000 ft. until pipe was set. Operator changed to lime-base mud at 10,400 ft., with mud weight up to 11.6 lb. per gallon. At 10,400 ft., mud weight was stepped up to 12 lb. per gallon and viscosity 55. This weight was maintained to a depth of 10,923 ft., where 9⅝-in. was set with 900 sacks of slow-setting cement. (Twelve casing centralizers were used.)

Mud weight was then built up to about 12.4 lb. per gallon while drilling under the 9⅝-in. At 11,200 ft., mud weight was again increased to 14 lb. and viscosity of 60. At 11,500 ft., weight was brought up slightly to 14.1 lb., and viscosity 60. At 11,800 ft., weight was further increased to 14.7 lb. and viscosity of 75; at 12,000 ft., 15.1 lb. with 75 viscosity; at 12,500 ft., 15.6 lb. and viscosity of 75. This was used to a depth of 13,500 ft., where it was stepped up to 15.7 lb. and viscosity of 80. At 13,700 ft. mud weight was increased to 15.9 and viscosity reduced to 70; and at total depth of 14,120 ft., mud weight had reached 16.1 lb. and viscosity of 70.

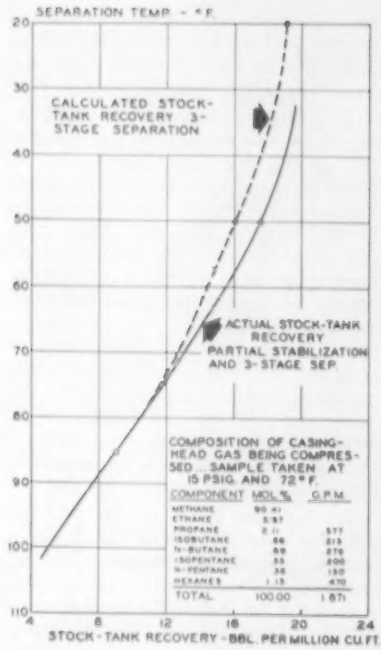
Running of 7-in. pipe to 14,113 ft. in this hole, which was 8⅜ in. in diameter, occurred without unusual incident, although most everybody told Conoco it "couldn't be done."



Four 400-bbl. storage tanks take oil from 1 Petitjean. It is moved from here to loading rack, where tank trucks pick it up for transport to nearby Interstate Oil Pipe Line Co. Conoco et al. produce about 4,000,000 cu. ft. of gas daily from the field for fuel purposes only.


STANDARD SEPARATOR WITH COIL IN BOTTOM
HOT WATER FROM ENGINES - 160°F
CHILLED WATER 60 G.P.M. INLET TEMP. 46°F OUTLET TEMP. 40°F
TO TANK
2ND STAGE
3 H.P. WATER PUMPS
WATER CHILLER 25 TON
GAS OUT 45°F
GAS IN 85°F
GAS TO SALES - 2700 MCF/D
GAS FROM COMPRESSOR - 240°F
HEAT EXCHANGER
TWO SECTION HEAT EXCHANGER
GAS TO HEATER 15 MCF/D 25 PSIG
1 HP PUMP ON STEAM CONDENSATE TRAP
CONDENSING WATER IN TEMP. 90°F OUT TEMP. 107°F 80 G.P.M.
COOLING TOWER
STEAM GENERATOR 5# STEAM 450,000 BTU/HR

Absorption-type refrigeration unit installed for extraction of condensate from natural gas for Republic Natural Gas Co., T. J. O'Connor lease, Old Refugio field.



Stock-tank recovery versus separation temperature.

Applying absorption-type refrigeration to

Condensate Extraction From Lean Gas

by L. A. Beecherl, Jr.

WHAT is best procedure for economically extracting liquids from 2,700 M.c.f.d. of lean South Texas casing-head gas? An engineering survey of this problem showed:

- Absorption type of mechanical refrigeration should give best payout.
- A 25-ton water chiller, designed primarily for air conditioning, was installed. Anticipated payout time is 9 months.

With the steadily increasing value of natural gas, many small compressor stations are being set to take casing-head gas and compress it for jetting and sales. Normally these compressor plants make no attempt to extract liquid hydrocarbons from the gas prior to sales. This is primarily occasioned by the fact that volumes are too small and the gas is too lean to warrant expensive condensate-extraction equipment.

There have been some package gasoline plants used which employ refrigeration as a condensate-extraction method. These units cost a minimum of $40,000 and require considerable operating cost. Since the majority of gas in the South Texas area contains 1 gal. or less of gasoline per 1,000 cu. ft. and since a recovery of from 30 to 40 bbl. per day must be obtained to show an attractive payout, these plants have found very little application.

Author is with Andrus, Beecherl & Wetegrove, petroleum and natural-gas consultants, Corpus Christi, Tex.

Refrigeration Investigated—Payouts

Republic Natural Gas Co. has a compressor plant operating in Old Refugio field where it is gathering an average of 2,700 M.c.f. per day of casing-head gas at 20 psig. and compressing it to 300 psig. for sales. At the average yearly temperature of 85°, the natural separation was 9 bbl. of condensate per million cubic feet of gas or 24 bbl. of condensate per day. It was noticed that recovery increased considerably on the colder days when the cooling tower would cool the gas to about 70° F.

An investigation was made into the possibility of refrigeration for the extraction of a higher percentage of the liquids from the gas. The graph shows the calculated expected recoveries at various separation temperatures. It was found that the package gasoline plants showed considerable additional recovery, but the payout exceeded the expected life of the property. An economic study was then made on installation of refrigeration equipment to lower the gas temperature to the approximate hydrate point. At this temperature, no dehydration or stabilization equipment was needed which was a considerable saving in initial cost.

Mechanical refrigeration . . . Compression-type refrigeration employs power-driven compressors as an energy source while the absorption type requires some type of heat as an energy source. It was found that an absorption-type refrigeration unit could be installed for considerably less cost. There are several companies that build absorption-type refrigeration units in accordance with tonnage requirements. It was found that Servel Co.'s standard 25-ton unit was the most economical refrigeration equipment that could be purchased to handle the cooling requirements on Republic Natural's plant. This unit would not take the temperature quite as low as the compression-type equipment. The minimum temperature at this time is 30° F., but this is lower than the sit-

uation requires. An installation cost and payout analysis was made. The anticipated payout showed to be 9 months, so a Servel unit was installed.

The sensible heat in cooling 2,700 M.c.f. per day (6,000 lb. per hour) of 0.7°-gravity gas from 85° to 45° is 120,000 B.t.u. per hour. The latent heat of condensation was calculated to be 80,000 B.t.u. per hour. Thus, 200,000 B.t.u. per hour was the total maximum heat load expected of approximately 17 tons of refrigeration excluding any radiation loss. As can be seen, the 25-ton water chiller would be ideally sized for this job. However, the capacity of the installation could have been increased by installation of an after heat exchanger to take the cold lean gas after separation and cool the incoming wet gas prior to chilling.

The hydrate point at 300 psi. line pressure should be about 48° F. Since no dehydration equipment was used we expected hydrate trouble if the gas was cooled too far below the hydrate temperature. Republic Natural has been operating its chiller to give a gas temperature of 45° to 50° F. For an additional safety measure, a heating coil was placed in the bottom of the first-stage separator through which hot water from the compressor engine is circulated. The bottom of the separator can be heated to 120° F., thus preventing any hydrate trouble and giving partial stabilization.

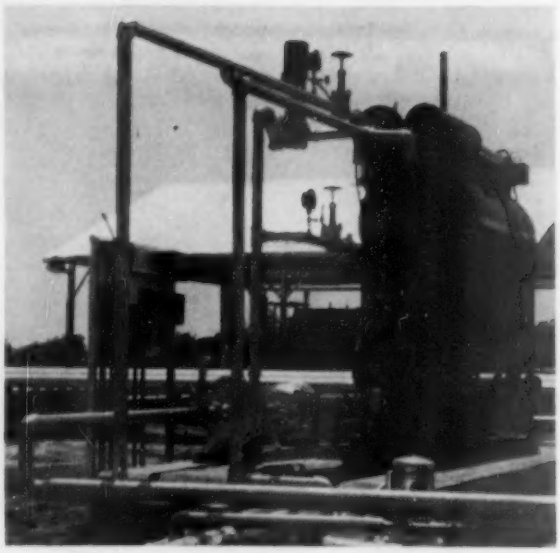
Using Servel Water Chiller

The water chiller is primarily designed for air conditioning. With little or no alteration it has proved very satisfactory when installed for oil-field use. It is self-operating with electrical controls for regulation and safety.

Fuel gas . . . In addition to the basic water-chiller unit, it was necessary to purchase a steam generator to furnish heat, two 3-hp. centrifugal water pumps, a 1-hp. steam condensate pump, and necessary piping for circulating condensing water through existing cooling tower. The steam generator used was a 3 by 7½-ft. unit with a 500,000 B.t.u. per hour rating. At maximum capacity, the chiller requires 450,000 B.t.u. per hour heat in the form of 5-lb. steam. Under maximum operating conditions the steam generator will use approximately 700 cu. ft. per hour of natural gas. The average consumption of natural gas for fuel is in the neighborhood of 15 M.c.f. per day. This gas was taken off the low-pressure casing-head system and is practically negligible in daily operation. The water chiller requires dry steam so it was necessary to insulate the 75-ft. steam line from the unit to the steam generator.

The centrifugal water pumps are used to circulate the chilled water to the heat exchanger and the condensed water from the cooling tower to the condensing coils in the water chiller.

Water usage . . . It is necessary to circulate condensing water at a rate to remove 700,000 B.t.u. per hour of heat when the unit is operating at full capacity. The cooler the condensing water used, the higher the efficiency of the unit. The unit efficiency and capacity drop severely when the condensing water return temperature is higher than 90°.



Closeup of water chiller installed in Old Refugio field.

Republic Natural is using a cooling tower previously installed at the plant. This tower had sufficient capacity with no additions to handle this extra heat load. If no tower had been available, it would have been necessary to purchase a 50-ton forced-draft cooling tower. The cooling tower on the Republic Natural is designed with a 95° outlet temperature. On extremely hot days, the condensing water temperature is 95° to 100° which lowers the efficiency and capacity of the chiller to about 15 tons of refrigeration. This could be corrected by using a forced-draft tower designed with a maximum of 90° water temperature.

Economics

The cost of equipment installation and supervision of the completion refrigeration unit was $15,000. The following table shows the monthly revenue and payout of the installation. These are actual production figures and are somewhat higher than initially anticipated.

1. Initial cost		
Complete equipment cost: Includes design, supervision and installation		$15,000.00
2. Recoveries at 2,700 M.c.f. per day (sales)		
Average daily condensate production after installation of refrigeration equipment (operating at 50° F.), bbl. per day	47.0	
Average daily condensate production before installation of refrigeration equipment (operating at 85° F.), bbl. per day	24.0	
Additional recovery by use of refrigeration, bbl. per day	23.0	
3. Revenue		
Gross additional revenue per month, 23 bbl. per day × 30.6 days per month × $3.20 per bbl.		$2,252.00
Operating cost per month:		
Royalties	$281.00	
Taxes	90.00	
Operating expense	200.00	
Total	$571.00	
Net additional revenue per month		1,681.00
Net additional revenue per year		$20,172.00
4. Payout		
Time to pay out $15,000 installation, $15,000 ÷ $1,681, months		9.0

There are no moving parts in the water chiller so there is very little repair or replacement. The only moving parts are the electrically motored water pumps. The electrical bill to run these pumps averages about $50 per month. The water chiller on Republic Natural lease had been in operation approximately 3 months and has required practically no maintenance or attention.

Conclusion

The absorption-type refrigeration unit for condensate extraction from gas seems to have an excellent application in the oil field. The operation and maintenance cost seem to be a minimum which makes the installation even more attractive.

From calculations, it has been found that by refrigerating gas to just below the natural hydrate point, approximately 85 per cent of the pentane plus can be extracted. This is about the same as 85 per cent of a charcoal gallons per thousand analysis. If the additional recovery is 10 bbl. per day, payout will be less than 2 years.

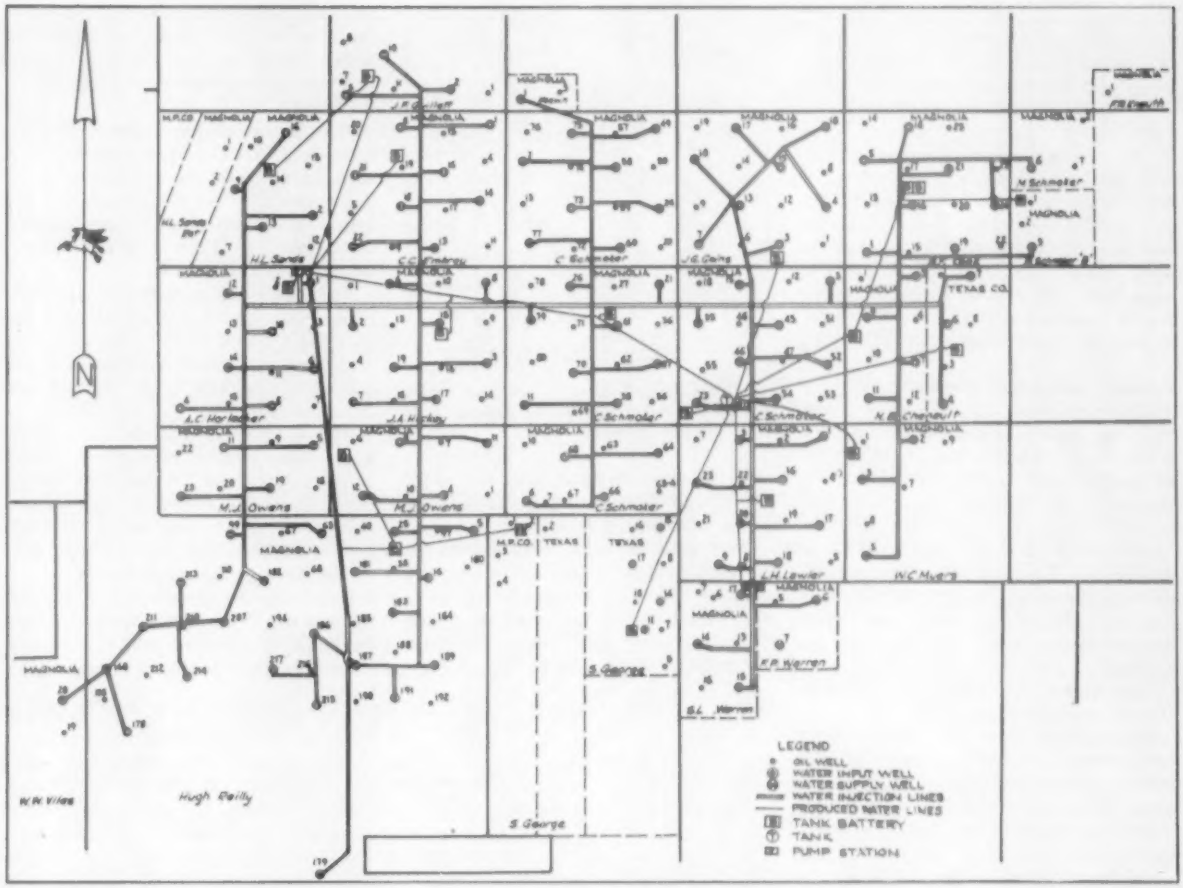


Fig. 1—West Burkburnett field. Pilot flooding was carried out on the J. G. Goins lease at upper center, and then expanded to include entire field.

What Magnolia learned from the highly successful

WEST BURKBURNETT WATER FLOOD

Performance data acquired have been extremely useful in planning other floods in the area

by J. W. W. Whitney

Since the start of water flooding in West Burkburnett field of North Texas, the daily oil production of most of the wells has increased several fold. Magnolia Petroleum Company's daily production in the field has increased from 250 bbl. in 1942 to 7,000 bbl. in August 1953. Present average production is still in excess of 5,000 bbl. of oil per day. Data from this very successful water flood is being extremely useful in planning other floods in the Burkburnett area.

WEST Burkburnett field is one of the producing reservoirs in what was originally called Old Burkburnett field. It is located approximately 2 miles southwest of Burkburnett in Wichita County, Texas, and is one of the larger shallow fields in North Texas. A very

Author is district engineer, Magnolia Petroleum Co., Electra, Tex. Paper presented at secondary-recovery symposium of North Texas Oil and Gas Association and North Texas section of A.I.M.E., Wichita Falls, November 17, 1954.

successful water flood is being conducted in the field by Magnolia Petroleum Co. in the Gunsight sand of the Cisco series and the Pennsylvanian age. The sand is found at a depth of 1,600 to 1,850 ft.

The producing structure is a monocline dipping about 120 ft. per mile from south to north. The sand lenses into shale on all sides of the reservoir and is interspersed with shale laminations throughout. Major axis of the lense runs east and west and the lense covers approximately 2,700 acres with an average gross thickness of 15 ft.

Primary production history . . . West Burkburnett was discovered in June 1912, by the Corsicana Petroleum Co., which later transferred its holdings to Magnolia Petroleum Co. The discovery well was Chris Schmoker 1, which had an initial production of 85 bbl. per day. Development of the field continued through 1926 with initial production of the wells varying from 5 to 125 bbl. per day. The average initial daily production was 30 bbl. of oil and no water.

The wells were drilled on uniform 10-acre spacing, although several of the inside location were not drilled. Magnolia owned about 80 per cent of the primary productive area on which there were 221 wells drilled. The data presented in this paper are based on Magnolia's leases.

All the wells were drilled with rotary and casing set 40 to 90 ft. above the top of the sand. The wells were drilled in with cable tools and a slotted or perforated liner set through the sand. The casing was not cemented in wells drilled in the early development of the field. The sand was shot with 30 to 60 qt. of ntroglycerine in most of the wells. Vacuum of about 18 in. Hg was pulled on the casing of the wells early in the life of the field and the wells were pumped by central powers.

The production decline was normal through 1938 when Magnolia's production was 187 bbl. per day. In an attempt to arrest this decline, a gas-injection program was started in July 1936. The first effects of this gas injection were received in 1939. When the gas injection was discontinued in 1942, Magnolia's production was up to 258 bbl. per day; however, a portion of this increase is attributed to workovers and cleanouts. The main reason for discontinuing gas injection was the high cost of purchasing gas for injection.

Reservoir properties . . . The original bottom-hole pressures and gas-oil ratios are not known, but are assumed to have been low. The reservoir is thought to have had a solution-gas drive and the oil was undersaturated. There was no water table or water drive, and the small volumes of water produced were the result of leaks in the casing or around the casing shoe.

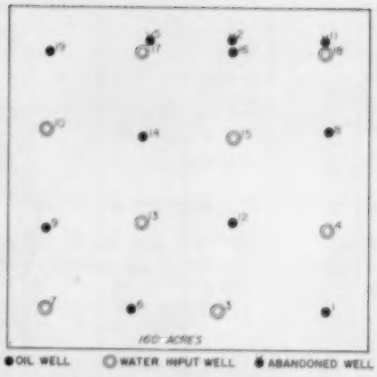


Fig. 2—Magnolia's J. G. Goins lease which was pilot flooded. Production jumped from 40 to 755 bbl. per day.

Core analyses were obtained on all the wells drilled for secondary-recovery purposes. Most of the producing wells were cored with a cable-tool core barrel in formation oil. The water-saturation values obtained from the analyses of these cores are assumed to be representative of the amount of interstitial water found in the sand. A typical analysis of a cable-tool core is shown in Table 1.

All the water-input wells were rotary cored with a water-base mud having a high water loss. The oil saturation of these cores is approximately the residual oil saturation to be expected after water flooding. Table 2 is the analysis of one of the rotary cores.

The values of permeability and porosity were obtained by averaging the analyses of about 700 core samples. The project-average reservoir data from the core analyses and other sources are shown in Table 3.

The sand appears to be fairly clean with shale streaks throughout which account for about 25 per cent of the gross thickness. However, the permeability to water containing 100,000 p.p.m. of chlorides was 73 per cent of the average permeability to air. In comparison, the permeability to fresh water was 30 per cent of the average permeability to air, which indicates there may be some clays present.

TABLE 1—TYPICAL CABLE-TOOL CORE ANALYSIS, WEST BURKBURNETT FIELD, WICHITA COUNTY, TEXAS

Depth, ft.	Permeability, md.	Porosity, per cent	Residual liquid sat., per cent pore space	
			Oil	Water
1,768	19	22.5	41.7	28.0
1,769	84	21.7	38.7	22.1
1,770	118	21.4	56.1	15.4
1,771	43	17.5	48.6	10.3
1,772	35	11.3	65.4	9.7
1,773	118	20.0	50.0	17.5
1,774	54	17.9	73.2	11.2
1,775	77	22.6	44.7	42.0
1,776	66	18.0	44.4	32.8
Average	68.2	19.2	51.4	21.0

Cored with cable tools in produced oil.

TABLE 2—TYPICAL ROTARY CORE ANALYSIS, WEST BURKBURNETT FIELD, WICHITA COUNTY, TEXAS

Depth ft.	Permeability, md.	Porosity, per cent	Residual liquid sat., per cent pore space	
			Oil	Water
1,759	115.0	23.4	26.9	31.2
1,760	112.0	31.6	27.5	37.0
1,761	222.0	28.1	26.0	39.2
1,762	2.0	22.4	27.2	34.8
1,763	114.0	28.5	23.5	35.1
1,764	21.0	12.8	24.2	18.0
1,765	301.0	27.4	25.6	50.0
1,766	92.0	26.8	26.2	46.2
1,767	230.0	29.5	21.0	45.4
1,768	110.0	27.3	25.3	41.8
1,771	93.0	26.9	21.9	46.8
1,772	126.0	27.4	23.4	47.8
1,773	72.0	26.3	22.8	38.0
1,774	34.0	20.9	26.8	51.6
1,775	2.3	18.5	31.9	43.2
Average	111.1	25.2	25.3	40.4

Cored with rotary in water base mud.

TABLE 3—RESERVOIR PROPERTIES

Average porosity, per cent	22.2
Average horizontal permeability, md.	53.2
Residual oil saturation after flooding, per cent pore space	27.0
Estimated original formation volume factor	1.06
Estimated present formation volume factor	1.02
Oil viscosity at BHP of 12 psig. and BHT of 89° M. cp.	2.25
Oil gravity at 60° F., A.P.I.	42

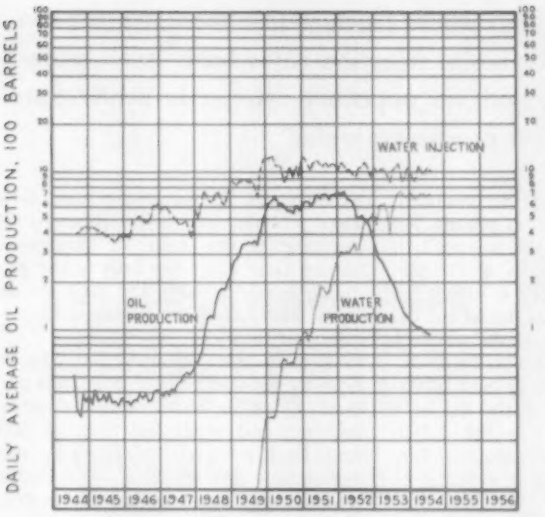

DAILY AVERAGE OIL PRODUCTION, 100 BARRELS
DAILY AVERAGE WATER INJECTION & PRODUCTION, 100 BBLS.
WATER INJECTION
OIL PRODUCTION
WATER PRODUCTION
1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956

Fig. 3—Production history of the West Burkburnett pilot flood.

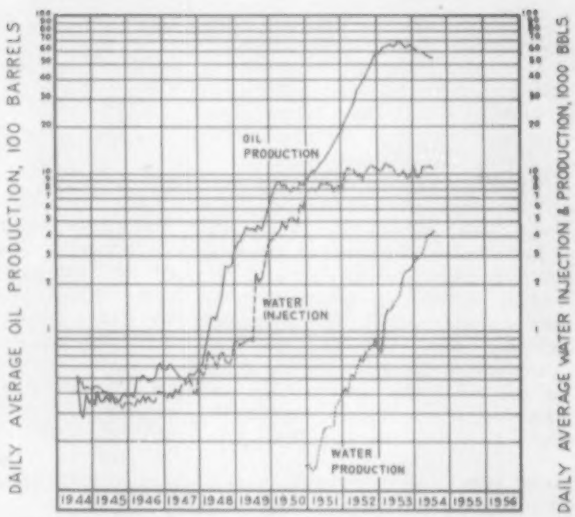

DAILY AVERAGE OIL PRODUCTION, 100 BARRELS
DAILY AVERAGE WATER INJECTION & PRODUCTION, 1000 BBLS.
OIL PRODUCTION
WATER INJECTION
WATER PRODUCTION
1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956

Fig. 4—Production history of the entire West Burkburnett flood.

Pilot water flood . . . A pilot water flood was initiated in 1944 on Magnolia's J. G. Goins lease shown in Fig. 2. This lease, located in the northeast section of the field, contains 160 acres and was developed on 10-acre spacing. However, only 11 wells were drilled for primary purposes, leaving the four inside locations and the northwest-corner location undrilled. Three wells were abandoned before secondary recovery was started, which necessitated the drilling of eight wells to fill out the 10-acre spacing.

Seven of the 16 wells were converted to water-input wells in 1944 and one other well was converted in 1948. This produced a 20-acre five-spot flood pattern. And since the lease north of the Goins lease was never developed for flooding, only the 138 acres of the lease which were south of the northern row of wells on the lease were considered effective within the flood limits. There was considerable migration of injected water off the lease in all directions, resulting in the edge injection wells being only partially effective. This factor was taken into account in calculating effective fill-up in the pilot flood.

Injection history . . . Fig. 3 gives the production and injection history of the pilot flood. Water injection was started into seven wells in July 1944 at the rate of 400 bbl. per day or about 4 bbl. per day per foot of sand. Water was obtained from shallow fresh-water sands and injection was by gravity head. The injection rate was increased in March 1946 to 500 bbl. per day and again in October 1946 to 600 bbl. per day. However, in 1947 the injection rate began declining, and it was found that the input wells were being plugged with iron precipitate. Several of the input wells were then acidized with 250 gal. of 15 per cent HCl acid which resulted in marked injection-rate increases. Also, Well 7 was converted to an injection well in January 1948, and the total injection rate increased to 700 bbl. per day, which is 6 bbl. per day per foot of sand. Late in 1949, three intion wells were shot with 1 to 1½ qt. of nitroglycerin per foot of sand, resulting in increasing the total injection rate to somewhat less than 800 bbl. per day.

In 1949, expansion of the water-flood project was begun. This increased the demand for supply water and resulted in the drilling of a Canyon-Ellenburger water-supply well. This well was completed in September 1949, and the injection rate on the Goins lease was then increased to 1,200 bbl. per day or 10 bbl. per day per foot of sand. However, due to increased water demands by the newly developed portion of the project and a build-up of injection pressures as a result of reservoir fill-up on the Goins lease, the injection rate was reduced for about 6 months of 1950 until a pressure pump could be installed to handle the entire project. Since that time, the well-head pressures have increased to over 650 psi. on some wells and the injection rate has been fairly level at about 1,000 bbl. per day. Total injection has been almost three million barrels of which 620,000 bbl. were recycled water.

Production history . . . Because of this rather slow and erratic injection, the pilot flood did not respond to the water injection for 3 years. The first oil-production increase was noted in June 1947, when the reservoir had an estimated net fill-up of 50 per cent. The production increased from 37 bbl. per day at the start of flooding to almost 700 bbl. per day in March 1950, after which it fluctuated as the injection rate changed, indicating the voids in the pilot-food area to be 100 per cent filled. The peak production for any one month was attained in February 1952, when the daily average was 755 bbl.

The cumulative oil recovery from the Goins lease to the start of water injection was 630,000 bbl., or approximately 4,000 bbl. per acre for the entire lease. The recovery from that time through August 1954, was 1,012,000 bbl., or 7,300 bbl. per acre for the water-flood area. It is estimated that an additional 100,000 bbl. would have been recovered by primary means had not water flooding been initiated. Taking this into account, the secondary recovery from this lease on a per acre basis has been more than 1.5 times that of the primary recovery.

Development of the project as a whole was done during 1949 and 1950, the east half being developed first. It now includes 2,250 effective acres with a gross sand thickness of 15 ft. The project now contains 130 producing wells, 125 water-input wells, and one water-supply well.

Complete practices . . . There were 133 wells drilled to complete the 20-acre five-spot pattern established on the pilot flood. All these wells were drilled with rotary tools and completed in open hole with casing set on top of the sand. The water injection wells were cored with a conventional core barrel using a high-water-loss mud before casing was set. The sand was shot in these injection wells with 1½ qt. of nitroglycerin per foot of sand. A 4-in. line pipe was used as casing in most of the injection wells and no tubing was installed. The original procedure was to cement this pipe with only 50 to 100 sacks, but this was later changed

and cement was circulated on many of the wells.

After setting casing, the producing wells were cable-tool cored in formation oil using a cable-tool core barrel. These wells were completed naturally and 7-in. casing was cemented with 100 to 150 sacks of cement. The wells were each equipped with 2½-in. tubing, a 2¼-in. metal tubing pump, ¾-in. sucker rods, and a 57,000-in./lb. pumping unit powered by a 10-hp. electric motor.

Many of the old producing wells were converted to water-input wells. This was done by pulling the liner, cleaning the well out to bottom, shooting the sand with nitroglycerin, and cementing a new liner on top of the sand.

Water supply, distribution . . . The water for the entire project is now being supplied by a 2,700-ft. well drilled through the Ellenburger and about 200 ft. into the Cambrian. The 8⅝-in. casing was set on top of the Canyon at 1,880 ft. and cement circulated. The well was acidized with 2,000 gal. of acid and completed in open hole. It is pumped by a submersible centrifugal pump run on 5½-in. casing. It has supplied over 13 million barrels of water and is presently producing 11,000 bbl. per day with a drawdown of 110 ft. and a working fluid level of 210 ft. from the surface.

This water contains 110,000 p.p.m. sodium chloride and has a specific gravity of 1.1 and a pH of 6.2. No treatment before injection is necessary except to control corrosion. It is injected through a closed system with all oxygen excluded by oil and gas seals on the gathering tanks.

As shown in Fig. 1 the water is pumped from the water-supply well through 2 miles of 7-in. line to the pressure station in the west central portion of the field. Since the well produces about 40 M.c.f. daily of gas, the water passes through a 4 by 10-ft. separator and then into a 1,500-bbl. storage tank. It is pumped from this tank through a 6-in. main line running east-west through the field and then through 4-in. north-south laterals. Individual 2-in. lines lead from these laterals to each input well where the water is metered before being injected down the casing. The volume injected into each well is regulated by a globe-type throttling valve. All lines are steel pipe with bitumastic coating on the outside and internal coating.

The pressure station consists of three 3¼ by 5 in. vertical quintuplex-plunger pumps with porcelain plungers. These pumps are each driven by a 150-hp. gas engine with a V-belt drive. Only two of the pumps are needed to handle the 11,000 bbl. per day at 700 psi.; one pump is held as a standby.

"In the few cases where fracture treatments have been used on injection wells, injection rates have been materially increased with no apparent change in production rates of the offset producing wells."

Also shown in Fig. 1 is the produced-water gathering and return system. All the produced water in the eastern half of the field gravitates to a 500-bbl. redwood tank. From there it is pumped by a centrifugal pump back to the 1,500-bbl. storage tank at the pressure station where it is mixed with the make-up water. Water from other tank batteries gravitates, some with the aid of a pressure heater-treater, to the 1,500-bbl. tank or is pumped into the 7-in. line from the water-supply well.

Injection history . . . The production and injection history of the entire project is given in Fig. 4. Injection rates on new injection wells were started at 3 bbl. per day per foot of sand and gradually increased over a year's time to 10 bbl. per day per foot of sand. The injection was purposely started low to allow the buildup of a bank of water around the injection well in an attempt to prevent possible channeling.

The cumulative injection through August 1954 was about 17 million barrels, of which 2 million barrels was recycled water. The present injection rate is 11,000 bbl. per day. To date there have been 2.7 bbl. of water injected per barrel of oil produced. Almost the entire project is considered 100 per cent filled up. The cumulative production from the start of injection is 6.3 million barrels of oil or 2,800 bbl. per acre. The daily average production in August was 5,100 bbl. of oil and 4,400 bbl. of water.

Operation Problems and Practices

Corrosion . . . There has been some corrosion in the injection and water-supply system. However, to date there has been no corrosion in the producing wells. The injection water is currently being treated with 10 p.p.m. of an amine-type corrosion inhibitor. No bactericide has been used although its use is now under consideration. Coupons are inserted at different points in the system to check the corrosion rate under all the existing conditions. The data obtained from this work indicate a considerable reduction has been obtained in the corrosion rate by the use of the inhibitor. Quantitative tests for oxygen content in the injection water show that the closed system has been effective in excluding air.

Abandoned wells . . . After the pressure was increased on the reservoir, some of the old improperly abandoned wells began to break out and flow. This problem has been alleviated by pumping tubing with an improvised cutting head down the hole to the producing sand, spotting 150 sacks of cement, and pulling the tubing out.

Well tests, meter readings . . . To efficiently operate a water flood it is necessary to obtain accurate data on actual injection and producing rates of each well. Each producing well has an individual flow line which is connected to a header at the tank battery where there is also a permanent test separator and meter which records the volume of fluid and the percentage of oil and water. Each well is, therefore, easily tested once each month. By use of these tests, records are maintained which allow an analysis of individual five-spot flood performance.

In conjunction with this, the injection rate into each injection well is determined by daily meter readings. From these data the cumulative injection rate in barrels and barrels per foot of sand is calculated and used in studying injection-well performance for possible remedial work.

Injection well workovers . . . Workovers of the injection wells have generally been of two classes: repair of casing leaks; and attempts to increase injection rates. Some of the wells in which the casing was not cemented from top to bottom have developed casing leaks and water has seeped out at the surface. In almost all cases, this has been eliminated by running an upside down packer on tubing and setting it in the liner or casing below the top of the cement.

Injection rates occasionally decline on some of the older injection wells, probably as a result of plugging of the sand face with iron precipitate which is the product of the corrosion experienced in the injection system. These wells are usually restored to their recommended rates by acidizing with 250 to 500 gal. of 15 per cent HCl acid.

However, some of the edge wells with low permeabilities do not respond to this acid treatment. As a last resort, these wells are given a light fracturing treatment using 500 to 1,000 lb. of graded sand, salt water, and gel. In the few cases where this treatment has been used, injection rates have been materially increased with no apparent change in the production rates of the offset producing wells.

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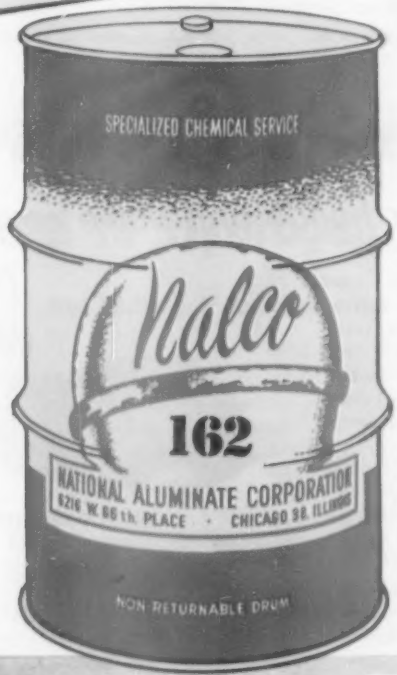

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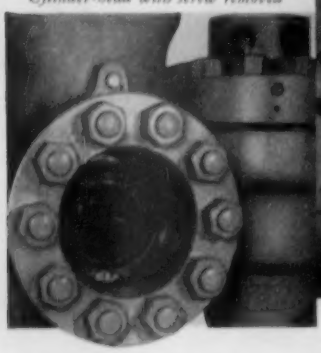
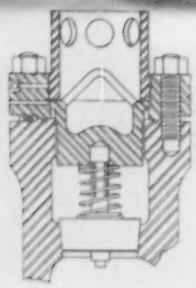
Cylinder-head assembly

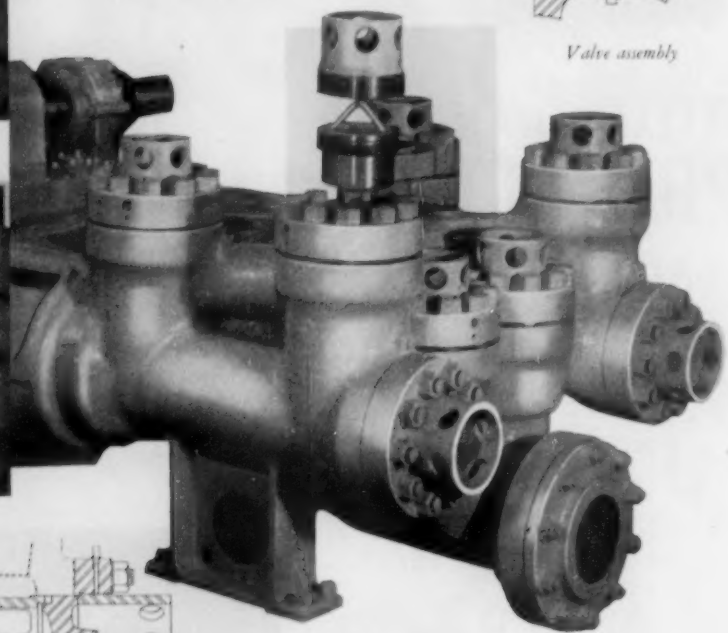
Cylinder-head with screw removed

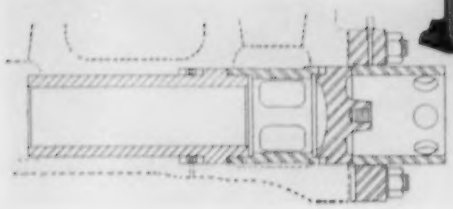


Fluid end of Bethlehem pump equipped with screwed-type cylinder heads and valve covers. Note "exploded" view of cover screw and valve cover (below).



Valve assembly





Liner and cylinder head

Here's how you save time

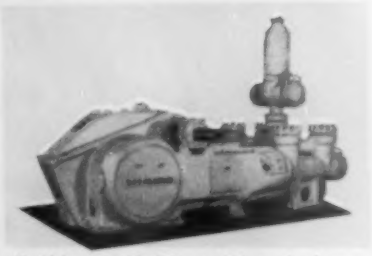
with Bethlehem screwed-type cylinder heads and valve covers

All five sizes of Bethlehem slush pumps can now be furnished with screwed-type cylinder heads and valve covers as optional equipment.

As shown in the illustrations, hollow cylindrical screws, threaded at the base, mate with threaded adapter rings. You remove them by a few easy turns, and thus have quick access to cylinder and valve assembly parts. No longer is it necessary to waste time removing cover nuts, and putting them back in place later on.

The screwed-type cylinder-head design greatly facilitates the servicing of packing, liners, pistons, piston rubbers, and rods. The valve cover arrangement materially reduces the time needed to service valves, seats, rubbers, and springs. The nuts that clamp the adapter rings in place remain permanently tightened, though they can be removed, of course, if need arises.

This optional screw-type design is but one of the many fine features of Bethlehem slush pumps. Offered in sizes for all drilling depths, the pumps are unusually powerful units with high volume capacities. The *smallest* will accommodate a 7¼-in. liner; the other four sizes, an 8-in. liner. Strokes range from 12 to 18 in.



Bethlehem 600 Slush Pump with standard covers

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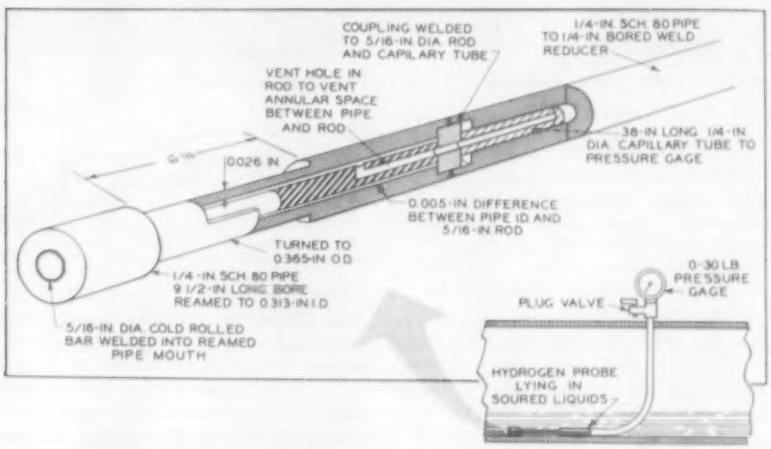
BETHLEHEM STEEL

Hydrogen attack caused sinusoidal breaks such as this on high-pressure gathering lines of El Paso Natural Gas Co. This break extended 3,156 ft. Fig. 1.


COUPLING WELDED TO 5/16-IN DIA ROD AND CAPILLARY TUBE
1/4-IN SCH 80 PIPE TO 1/4-IN BORED WELD REDUCER
VENT HOLE IN ROD TO VENT ANNULAR SPACE BETWEEN PIPE AND ROD
38-IN LONG 1/4-IN DIA CAPILLARY TUBE TO PRESSURE GAGE
0.026 IN
0.005-IN DIFFERENCE BETWEEN PIPE ID AND 5/16-IN ROD
TURNED TO 0.365-IN O.D.
1/4-IN SCH 80 PIPE 9 1/2-IN LONG BORE REAMED TO 0.313-IN I.D.
5/16-IN DIA COLD ROLLED BAR WELDED INTO REAMED PIPE MOUTH
0-30 LB PRESSURE GAGE
PLUG VALVE
HYDROGEN PROBE LYING IN SOURED LIQUIDS

Details of hydrogen-detecting probe and its placement within line. Fig. 3.

Trunk and gathering system on which breaks occurred. Fig. 2.

Unusual Pipeline Failures Traced to Hydrogen Blisters

by Felipe Paredes and W. W. Mize

PIPELINE ruptures of a very interesting and unusual nature occurred recently on the San Juan River plant-Barker dome trunk line and the Barker dome gathering lines of El Paso Natural Gas Co. Intensive study of these failures indicated conclusively that hydrogen blistering, with the necessary atomic hydrogen being supplied from internal corrosion, was the cause of failures. A typically ruptured section is shown in Fig. 1.

Organic inhibitor injection was successfully used to stop the internal corrosion and, in turn, the hydrogen blistering and resulting pipeline failures.

Though hydrogen attack on refinery vessels operating under high temperatures and carrying highly corrosive fluids is not unusual, this is the first known occurrence of hydrogen blistering on a gas-transmission line.

Authors are senior engineers with El Paso Natural Gas Co. Paper was presented at the ninth Petroleum Mechanical Engineering Conference of American Society of Mechanical Engineers, Los Angeles, September 26-29, 1954.

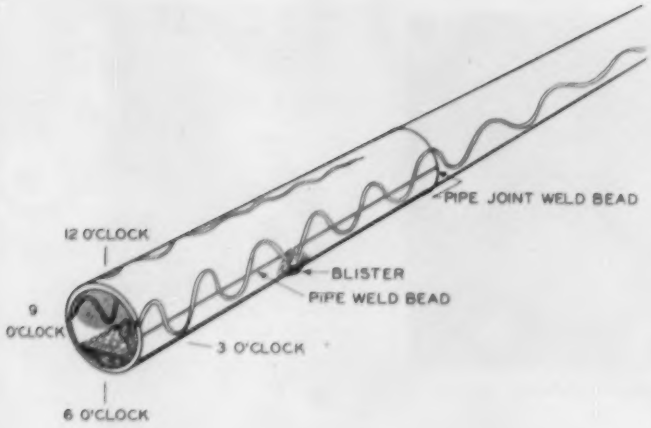
Hydrogen detector probe . . . Special probes were installed in the lines at locations shown on the map, Fig. 2, to determine the quantity of hydrogen present. Design of these probes is shown in Fig. 3.

It was reasoned that if hydrogen attacked the steel it would probably go through the thin-wall section of the probe and find an artificial cavity or metal separation at the annulus of the rod. Gas collected in the annulus would bleed off through a vent hole in the rod and out through a capillary tube to a pressure gage.

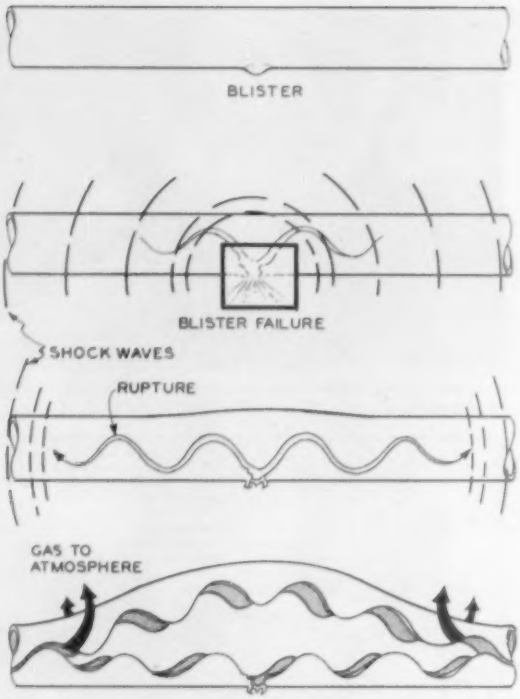
An indication of pressure was observed in three probes on the same day. Gas from a blister was analyzed and found to be 94 per cent hydrogen, 2 per cent methane, and traces of carbon dioxide and carbon monoxide. It was obvious that hydrogen blisters caused the failures.

To find the source of hydrogen, gas from each well in Barker dome was analyzed for hydrogen and other contaminants. Only one well showed a high content of hydrogen, 0.2 mole per cent. From the analyses it was decided that corrosion on the internal walls of the pipe was the source of hydrogen.

Because of the success of an organic inhibitor in combating corrosion and tubing failures in the wells at Barker dome, the same organic inhibitor was injected into the line on April 22, 1954, using 1 qt. of inhibitor per 4 M.M.c.f. of gas. On May 17, the last indication of pressure was recorded on the first probe below the point of injection. As the inhibitor traveled down the line



Above: Typical break pattern on pipe. Welds had no effect on pattern. Fig. 4.



Right: Breaks apparently followed this sequence after rupture of hydrogen blister. Fig. 5.

the probes stopped indicating pressure, evidence that corrosion was inhibited. There have been other breaks on the system since injecting the inhibitor but these were caused by the damage already in the pipe.

Description of breaks . . . Most of the breaks originated in the failure of a blister and most blisters broke toward the inside of the pipe against the gas pressure. In all breaks the pipe ripped in two places, 180° apart, usually at 3 and 9 o'clock. The breaks continued in this position and unraveled at the end as shown in Fig. 4.

The breaks followed a sinusoidal curve and the pattern was not disturbed by presence of welds. On one occasion a severed section of the pipe was carried 200 ft. away. Fig. 5 is an artist's conception of the breaks. The symmetry of the curve was broken only when the rip went through other blisters.

It was not difficult to determine the origin of the breaks since a peculiar cleavage fracture appeared on the wall of the pipe as shown by Fig. 6. The herringbone pattern pointed toward the origin of the break.

The rate of fracture is not known but in tests run by Battelle Institute, now studying the break characteristics, the rate of crack propagation has been estimated as high as 4,100 ft. per second. The break apparently follows a shock wave front with the characteristics of a brittle fracture. Fractures have been observed to travel many inches ahead of the visual break. Another picture of the breaks is shown in Fig. 7.

Theory of hydrogen attack . . . Many instances of hydrogen attack on low-carbon steel are known. Most of these have occurred in refinery vessels carrying exceedingly corrosive solutions at high temperatures. Apparently this was the first experience of hydrogen blistering in gas-transmission lines.

Corrosion is a source of atomic hydrogen. Hydrogen sulfide and carbon dioxide gases dissolve in water to form dilute acid solutions which attack iron according to the equation:

$$2Fe + \underset{\text{weak acid}}{2HAc} \rightarrow 2FeAc + H_2$$

A breakdown of this formula shows what takes place in the anode and the cathode of the corrosion cell, respectively:

$$Fe^{\circ} \rightarrow Fe^{++} + 2e$$

$$2H^{+} + 2e \rightarrow 2H^{\circ}$$

$$2H^{\circ} \rightarrow H_2$$

In the presence of a catalyst, atomic hydrogen will not combine to form molecular hydrogen, and it is this atomic hydrogen that is readily absorbed by the steel. The catalyst is H_2S and FeS. Hydrogen blistering is the result of atomic hydrogen penetration and the conversion of atomic hydrogen to molecular hydrogen at internal discontinuities within the steel. The amount of corrosion necessary to have an adequate supply of atomic hydrogen for hydrogen blistering is not known.

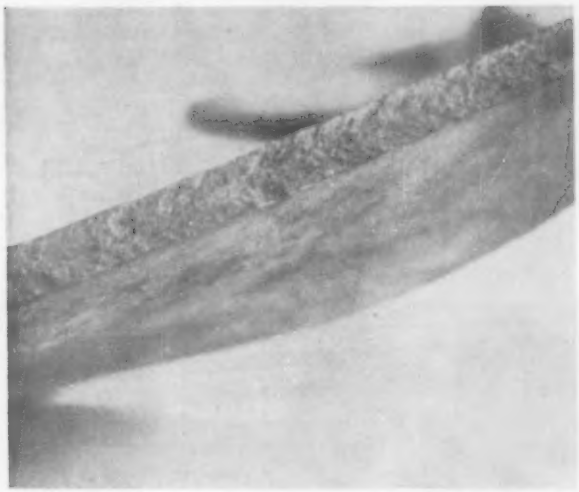
The refinery industry observed the following conditions necessary for hydrogen blisters:

1. A steel surface subject to corrosion.
2. A source of reactive hydrogen.
3. A liquid water phase.
4. An agent capable of poisoning steel surface so that the formation of molecular hydrogen from atomic hydrogen is retarded.
5. Gross imperfections in the steel, such as a slag inclusion, a void, a discontinuity, or minute imperfections such as rifts within single crystals.
6. A promoter which maintains an active surface.

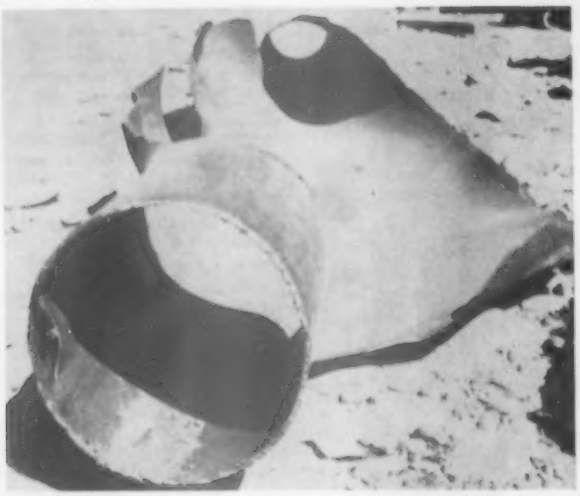
The steel surface subject to corrosion was the pipeline. Hydrogen sulfide and carbon dioxide in the gas caused corrosion which is the source of reactive hydrogen. The liquid water phase was the condensed moisture in the gas. Hydrogen sulfide was the poisoning agent which retarded the formation of molecular hydrogen. By virtue of the method of rolling and cooling, the steel plate offered the gross imperfections and discontinuity necessary for hydrogen blisters. Hydrogen sulfide is the promoter that maintains an active steel surface for the absorption of atomic hydrogen. Most of the breaks originated on the lower portion of the line where there is a higher concentration of water. Lower temperatures during winter months increased the amount of condensation.

High concentration of atomic hydrogen on the surface of the steel and a steel surface that can prevent the combination of atoms to molecules of hydrogen gas are conditions necessary for hydrogen penetration. The rate of diffusion of hydrogen through steel depend on:

1. **Condition of the steel.** Highly stressed such as cold-worked or im-



Chevrons on edge of broken pipe point to location of originating blister. Fig. 6.



Well-formed blister on ruptured section of 16-in. lateral. Fig. 7.

properly annealed welded steel shows greater diffusion rates than lower stressed steel.

2. **Low pH.** High penetration rates are found in low pH systems and decrease as the pH increases.

3. **Presence of a poisoning agent.** Laboratory experiments show that the rate of penetration increases with presence of cyanide and decreases as the cyanide concentration decreases.

4. **Temperature and pressure.** The solubility of hydrogen increases with temperature and is proportional to the square root of the partial pressure of hydrogen.

5. **Austenitic or ferritic steel.** Austenitic steels dissolve hydrogen four or five times faster than pure iron or low-alloy ferritic steels.

Preventive Methods

1. **An organic inhibitor** forms a tightly adherent adsorbed film on metal surfaces, perhaps one or two molecules thick. This film will adhere to the metal by forces of chemical union forming a closely packed barrier to the migration of corroding-agent molecules. On the line at Barker dome, the organic inhibitor prevented the hydrogen sulfide and water in the gas from attacking the steel.

2. **Alter the surface of the steel.** Precoating or lining with alloys of chromium and molybdenum or by the use of austenitic steels which have been found to be satisfactory at all temperatures and pressures.

3. **Polysulfide injection.** Laboratory experiments and experience in refineries have shown that polysulfide will afford a protective film to low-carbon steel to prevent hydrogen attack.

Pipe Specifications

The main line pipe was 24-in. o.d. by 271-in. wall, weighing 68.678 lb. per ft. It was electric-fusion-welded blacksteel pipe with ends beveled 25° for welding. Lengths ranged from 29 to 31½ ft. with no joint less than 27 ft. acceptable, in accordance with specifications L-1, dated January 1, 1949.

The pipe was manufactured from open-hearth steel plates with the inside weld bead being applied, with steel tabs in place, by means of automatic submerged-arc welding. Pipe was expanded with an increase in diameter approximately 1.75 to 1.95 per cent; pipe decreases in length approximately 2⅞ in. with a hydraulic pressure approximately 1,650 psi.

Hydrostatic test . . . A pressure of 1,060 psi. was held for 10 seconds and then reduced to 500 psi. and the pipe visually inspected for leaks.

Chemical analysis . . . All check analyses meet specifications L-1, which merely limits the carbon content to 0.30 per cent. All chemical analyses meet with the requirements of A.P.I. Std. 5-LX. Table 1 shows the results of analysis on the 24-in., 0.271-in. wall pipe.

Tensile tests . . . As required by specifications L-1, tensile tests were made on specimens cut from one length of pipe made on each heat of steel. Transverse tensile test specimens were cut approximately 90° from weld.

All the tensile tests meet with the requirements of specifications L-1 and also with the requirements of A.P.I. Std. 5-LX, with respect to minimum transverse yield strength of grade X-52 line pipe. Results of these tensile tests are shown in Table 2.

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2. Means of Combating Hydrogen Attack on Steel in Refinery Equipment, W. A. Bonner, H. D. Burnham, J. J. Conradi, and T. Skei, The Oil and Gas Journal, June 8, 1953, p. 100.

TABLE 1—TABULATION OF CHEMICAL ANALYSES

Ladle Analyses

	Per cent			
	Carbon	Manganese	Phosphorus	Sulfur
Maximum	0.28	1.00	0.049	0.046
Minimum	0.20	0.64	0.015	0.018
Average	0.243	0.778	0.0265	0.0311

Check Analyses

Maximum	0.29	1.06	0.056	0.047
Minimum	0.20	0.65	0.015	0.017
Average	0.245	0.803	0.0271	0.0315

TABLE 2—RESULTS OF TENSILE TESTS

	Transverse test of steel			
	Yield strength (psi.)	Tensile strength (psi.)	Elongation (per cent)	Transverse test across weld
Maximum	68,540	94,550	32.5	93,260
Minimum	53,280	73,240	23.0	76,070
Average	59,438	81,875	29.06	84,661

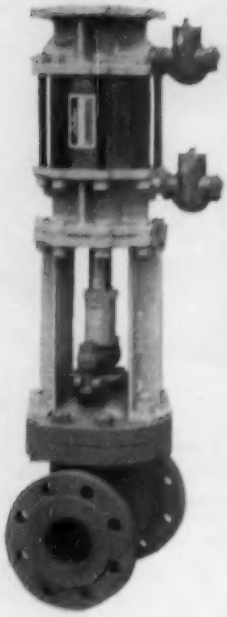


Fig. 1—(Left). A conventional gate valve, cylinder operated.

Fig. 2 (Right). Diagram showing pivot-type cylinder for operation of plug valves.

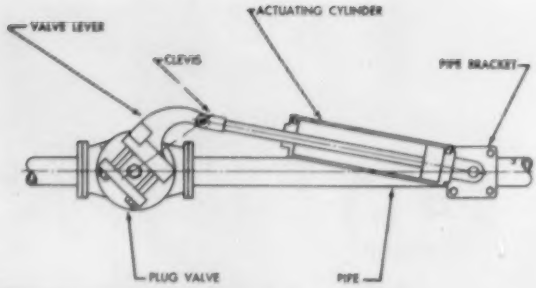
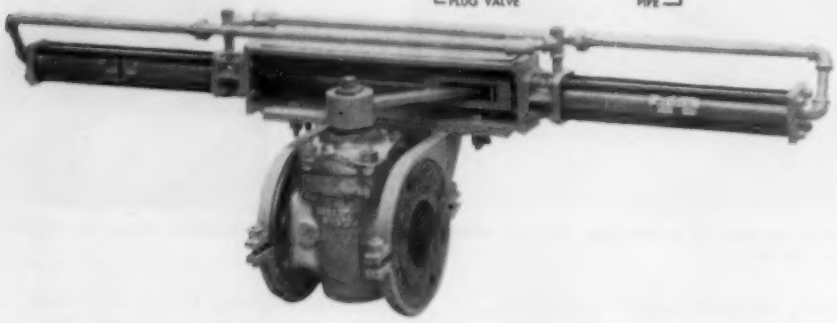


Fig. 3 (Below). Tandem-type actuator for larger plug valves.



Power Actuation of Flow Valves for

AUTOMATION OF LEASE OPERATIONS

Industrial motor valves have their place, but power actuation of conventional valves permits automatic operation of more leases

by Alexander A. Toben

THE application of automatic controls and devices for improvement of oil-field production, dehydration, and shipping methods calls for use of a considerable number of remotely and automatically operated valves. Industrial motor valves have a definite place in the design of automatic leases, but the use of power-operated, conventional flow valves will permit automation of many more production leases handling all sorts of crude oils.

The lubricated plug valves are available in a wide range of pressures and sizes, both screwed and flange design. Their construction assures positive shutoff even in use with oils having considerable sand content or other abrasive materials in suspension. On low-pressure pump manifolds, water lines, bleeders, and tank outlets, gate valves are very often preferred and used, permitting full flow without appreciable pressure drop across the valve and assuring positive shutoff.

These important considerations have brought about the development of power actuators for smaller sizes of both plug valves and gate valves which permit the use of these highly desirable valves in automatically controlled lease installations. While an electrical motor seems at first glance to be the simplest power and, in many instances, most desirable power, in reality it is not the most practical and not always an economical way to operate small

Author is with Ledeen Manufacturing Co., Los Angeles. From a paper presented at 1954 Petroleum-Mechanical Conference of A.S.M.E., Los Angeles.

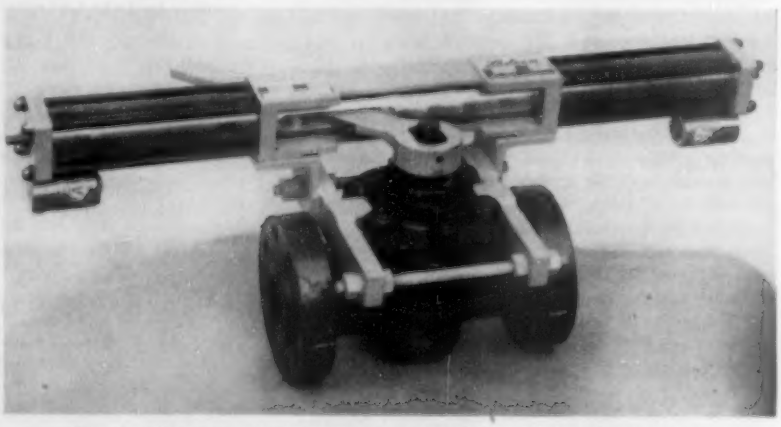


Fig. 4—Floating-bar dual actuator on 2-in. oil-field lubricated plug valve.

line valves. Successful actuators of this kind are in use for larger valves where the cost of such actuators can often be justified; but for small valves such as are required in operation of an oil-field lease, the cost of motor-driven rotary actuators will be out of proportion to the cost of the valve.

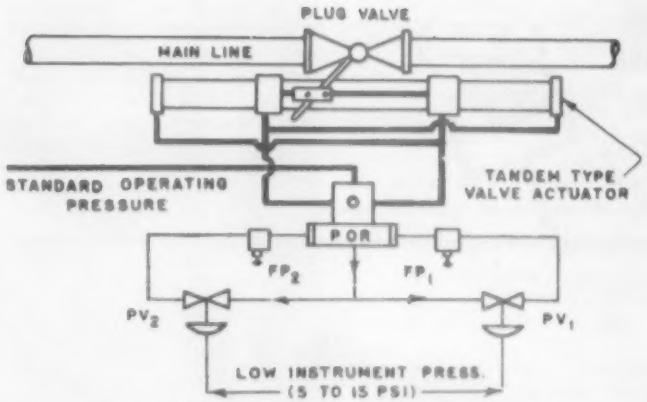
The other method of operation of line valves is the use of straight-line motors or cylinders directly connected to the valve stem and actuated by pressure fluid such as compressed air, natural gas, or hydraulic oil from a power unit. The pneumatic or hydraulic cylinder is a relatively simple piece of equipment having one slow-moving part (the piston). When properly built and installed, a cylinder is the most reliable piece of equipment and requires a minimum of maintenance.

For a gate valve . . . To operate a gate valve, a properly selected cylinder is installed by a simple bracket on top of the valve and the piston rod is connected with the valve stem by a coupling, as shown in Fig. 1. The whole operating mechanism can be purchased with the valve or readily adapted to valves already in service, thus saving the purchase of new valves when an automatic installation is contemplated for a lease already in operation. The action of such a gate-valve actuator is direct and requires no speed-reduction mechanism or other complicated fast-moving parts and devices.

For plug valves . . . On plug valves that require 90° rotation of the valve stem, the power of the actuating cylinder can be transmitted to the valve by one of the following methods. A cylinder installed on the valve bonnet is made a part of it; the piston rod actuates a guided rack which turns a gear segment mounted on the valve stem. This type of actuator is usually built and made a part of the valve itself and consequently has to be sold with the valve. Such valve and valve-actuating assemblies are successful with larger-size plug valves but have not been considered practical or economical for use on small plug valves.

The simplest and most economical way of using the cylinder in conjunction with the plug valve is to connect the piston rod to the crank or the valve and attach the opposite end of the cylinder to a bracket which will permit the cylinder to pivot, as shown in Fig. 2. Bracket, of course, has to be secured on a rig support near the valve. When the piston rod extends or retracts, it turns the crank 90° while the cylinder itself pivots slightly.

This type of actuator, while relatively reasonable in cost, can be criticized from the engineering viewpoint. Except when the cylinder is in a vertical position, it is not proper from the functional viewpoint to have the cylinder pivot from the blank end while the piston rod is pushing or pulling on the crank. The bracket supporting the cylinder clevis is, of course, a certain distance from the valve and when supported by the pipe (such as is the case of some commercial actuators of that type available) requires a very specific design of manifold and piping adjacent to the valve. A certain amount of un-



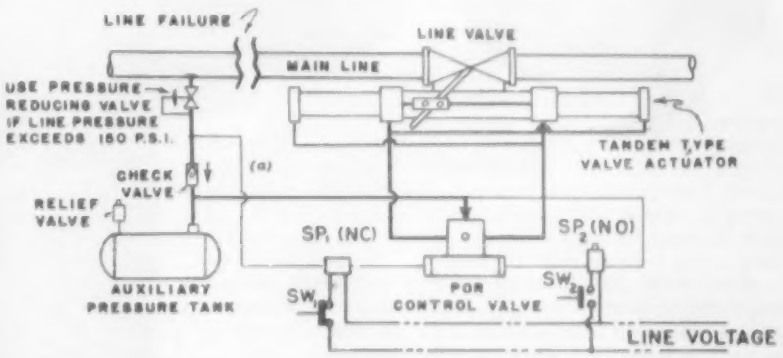
This system is for applications where low-pressure instrument air (5-15 psi.) is used to control the valve actuators.

The four-way, power-operated valve POR is controlled by small diaphragm-operated, three-way, normally open pilot valves PV-1 and PV-2. Poppets FP-1 and FP-2, in series with pilots PV-1 and PV-2, permit auxiliary hand operation. Instrument air actuating pilot PV-1 or PV-2 reverses four-way POR, moving the actuator in one direction or the other. Likewise, depressing hand poppet FP-1 moves the actuator in one direction, and depressing poppet FP-2 moves it in the opposite direction. The same pilots can be used to operate two or more POR control valves and, consequently, two or more actuators.

Four-way valves, operated by low-pressure diaphragms, spring loaded, can also be used for special control circuit requirements.

Instrument valves PV-1 and PV-2, if necessary, can be electrically operated instead of diaphragm operated. Three-way solenoid-operated pilots requiring only 10 watts are available with coils for most voltages, a.c. or d.c.

Fig. 5—Low-pressure pilot operation of pneumatic actuators by instrument air.



Both normal and emergency operation of cylinder valve actuators are made possible by the use of a power-operated four-way control valve POR with one normally open and one normally closed, continuously energized solenoid pilot, and an auxiliary pressure tank equipped with a check valve.

This safety shutoff feature is entirely automatic, requiring no precautionary steps, such as clutching in a safety mechanism, pulling a holding pin, or operating a lever.

Normal operation of the actuator is by momentarily depressing one or the other switch SW_1 or SW_2, thus reversing the control valve POR and closing or opening the main line valve.

When electric power fails, continuously energized solenoid pilot SP_1-NC closes, bleeding its side of the power piston in the control valve POR. Pressure on opposite side shifts control valve and main line valve closes.

When pressure line fails, same side of power piston in POR valve bleeds through continuously energized pilot SP_1-NC. Pressure from auxiliary tank shifts the power piston, reversing control valve POR, thus closing the main line valve.

When both pressure and electric power fail, valve POR shifts same as in the previously described cases and main line valve closes automatically.

The auxiliary pressure tank is normally supplied by main line pressure. When main line fails, the check valve prevents bleeding of the tank and maintains pressure necessary for safety operation.

Fig. 6—Automatic safety shutoff of pneumatic actuators in case of line-pressure or electric failure.

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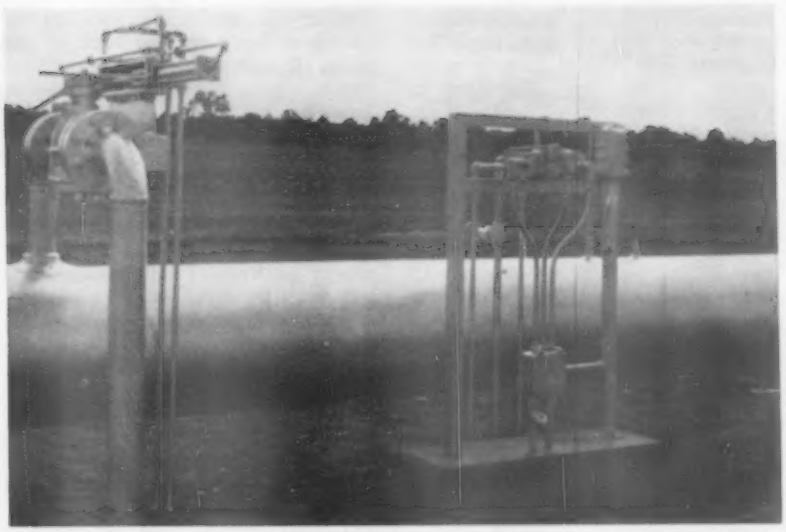


Fig. 7—Tandem actuator on a 4-in. high-pressure lubricated plug valve with four-way, three-position solenoid-operated control valve, connected to open the plug valve on electric-power failure.

due strain and side thrust is transmitted to the valve stem and to joint between pipe and valve.

This type actuator requires use of flexible hoses to bring operating pressure to the pivoting cylinder. For reasons of safety or other considerations such flexible hoses on pressure systems are often considered a serious disadvantage and in some cases are completely unacceptable.

Tandem dual actuators . . . Illustrated in Fig. 3, for use on valves requiring larger torques, is a tandem-type dual actuator which consists of two cylinders mounted on each end of a rigid center frame, having piston rods connected by a special coupling. This coupling operates a valve-turning torque lever which slides between free-moving hardened rollers in the coupling. Both cylinders are piped and work as one unit, transmitting their combined power to the lever. For smaller valves requiring smaller torques, a simplified type of dual actuator has been developed.

Floating-bar dual actuator . . . The actuator in Fig. 4 consists of two single-acting cylinders mounted on each end of a center frame. A floating piston rod slides freely in the bushings of the center frame. The torque lever extends through a slot in this rod and is in contact with hardened rollers on each side of the slot. Independent floating pistons in each cylinder operate the rod which, in turn, rotates the lever and with it, the valve.

The balanced design and operating method of these actuators eliminates damaging cantilever load on the valve body or eccentric loading on the stem of the valve. It is easily mounted on the valve by use of clamps or flange-type brackets, thus becoming a part of the valve itself. It can be used with new valves or those already in service. Rigid piping is used to connect the actuator to the pressure lines.

Control of actuators . . . To obtain the desired action of cylinder-type actuators and consequently of the valves they operate, it is necessary to control only the actuating cylinder by using small selector valves which can be operated either electrically or pneumatically by impulses from instruments or timer mechanisms. These small three or four-way selector valves are either directly solenoid operated or pilot operated. The availability of a considerable number of such pilots, and the relative simplicity of their adaptation to meet a great variety of control requirements is another powerful argument in favor of cylinder-type actuators.

The speed of motion of pneumatic actuators is easily adjusted by a globe or needle valve on the exhaust line or by simple speed-control valves mounted in one or both cylinder pressure lines. The speed of hydraulic actuators, of course, is the function of the pump displacement and consequently has to be controlled at the source of power. Figs. 5 and 6 illustrate some of these adaptations. One shows a simple valve control from low-pressure instrument signals and the other a more complex job combining operation of the valve both from an instrument signal and as a highly desirable automatic safety shutoff.

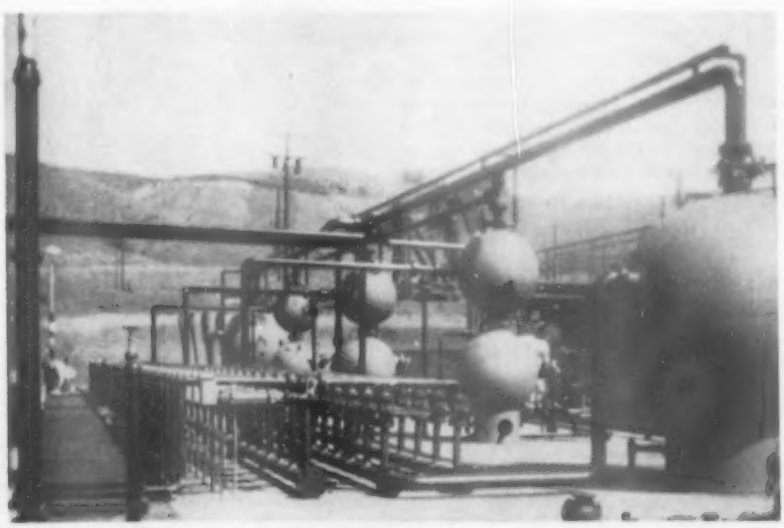


Fig. 8—Automatic lease operation. The header valves are pneumatically actuated on this lease in southern California.

Actuator Operating Fluids

The selection of pressure fluid for operation of cylinder type valve actuators will depend, of course, on availability of some sort of pressure fluid on the lease, characteristics of such fluid, the spread of the installation, and type of controls used and required.

Natural gas . . . Wherever natural gas is produced with oil or is available, the use of this gas should, of course, be considered first. If the pressure of the natural gas is or can be reduced to the practical and economical range desired for the operation of small valve actuators and their control valves (50 to 200 psi.), and especially if this gas is rather neutral, dry, and clean, it would constitute the ideal and cheapest power source. It can be conveyed directly to control valves and from

there to operating cylinders, and the relatively small amounts used for operation of each valve could be exhausted directly into the atmosphere.

Compressed air . . . If natural gas of desired characteristics is not immediately available on the lease, the use of compressed air produced by a small compressor usually electrically driven and located at some central point in the tank farm close to the main control panel would be most advisable. The small amounts of clean compressed air required for relatively infrequent operation of lease valves can be very economically produced. Such compressed air can be well filtered and lubricated at proper points. The use of clean compressed air of standard conventional pressures (75 to 150 psi.) permits a wide selection of small control valves either electrically or pneumatically operated, and is considered most practical and economical from viewpoint of over-all installation, original cost, and long-range maintenance.

Corrosive gas . . . In some instances the operators have at their disposal a considerable amount of natural gas of a rather high corrosive nature and many of them desire to use this source of available power in their valve-actuating systems. At first glance this seems to be a good approach, but the analysis of the specifications imposed by the use of corrosive gas shows that the original cost of valve actuators and their controlling valves which would meet these specifications becomes rather high and the selection and availability of such equipment are reduced considerably.

Comparative cost analyses made for some contemplated installations have indicated that, except in a few isolated cases, it is much more economical to disregard the existing sour gas available and to install a compressor unit as previously described. This will permit the selection and use of standard equipment and piping at much lower original cost and will also very considerably reduce replacement of wear parts which are bound to be corroded if sour gas were used.

In some cases a compromise solution could be suggested in which sour gas is used as a motive power for a turbine driven compressor or a gas-operated reciprocating hydraulic pump which, in turn, will generate clean operating pressure fluid for operation of all the elements in the valve-actuating system. In this case only one motor or turbine would have to meet the rigid specifications imposed by use of corrosive gas, and wear will be reduced to a few parts in the turbine or motor only.

This method may be criticized when valve actuators are installed directly at the wells and the lease consists of a considerable number of wells widely spaced. In this case, of course, the cost of a central power unit and piping system necessary to convey the clean fluid from the central plant to each well may overshadow the extra cost of corrosion-resistant materials required and used in the construction of individual valve actuators. However, in most instances all the valves which are to be automatically controlled beginning with the valves in the lead lines installed to divert the oil from individual wells into either gage line or manifold line, and ending with the valves at the shipping pump, can be located within the confinement of the tank farm. In such cases the objections to the use of a central compressor plant would definitely be invalid.

Field installation . . . The installation shown on Fig. 8 is one of the most modern, highly engineered automatic tank farms. It was designed and built by Shell Oil Co. at its Puente lease in southern California and shows all the wells on this lease converging toward one gaging manifold with diverting valves installed side by side right at the tank farm. At the time this installation was designed, the new floating-bar dual actuators were not as yet available and the lubricated plug valves used were equipped with single pivoting cylinder-type actuators, air powered and solenoid controlled.

Wherever automatic or semiautomatic installation is considered, the problem of protection against possible failure or malfunctioning of an instrument is even more acute than in man-operated and supervised leases. The use of compressed air or gas presents easy and highly reliable method of providing automatic safety shutoffs (or openings) of valves by permitting "storage" of reserve energy in individual small pressure tanks located next to valves to be so operated and released by one of many methods, according to the specific safety requirement.

Fig. 6, previously mentioned, is but one of many such automatic operating and safety control systems.

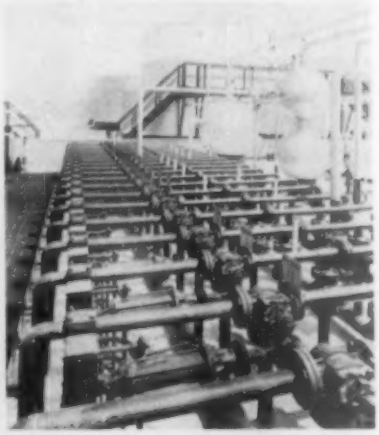
New power source . . . Another source of power which has been very successfully used in similar industrial applications but has not as yet been considered by designers of automatic oil-field producing leases due to its novelty, is the use of a slow-moving reciprocating air-oil or gas-oil pump which uses compressed air or available natural gas as the prime mover and delivers hydraulic oil at a preset pressure to all available actuators through proper piping, same as in a pneumatic installation, except that return lines are required to bring the oil back to the pump. If most of the actuator-operated valves are located relatively close together, it is sometimes more economical to use such a hydraulic system.

The available low air or gas pressure can be boosted by above-mentioned reciprocating booster pump to high pressure which will permit the reduction of sizes of cylinders required to operate each valve and consequently will result in saving on the initial cost of each unit. These savings sometimes will more than pay the cost of the power unit and return lines. The other consideration in favor of use of hydraulic fluid is the fact that hydraulic fluid protects the equipment by its lubricating and preservative characteristics and considerably reduces over-all maintenance.

How to Make Well Testing Automatic

TESTING oil and gas production on this Brea Canyon, California, field installation is a push-button operation. By means of a time clock, a solenoid in the plug-valve actuators is energized when the individual well is to go on test. Air pressure in the actuator cylinder then turns the three-way plug valve so that the flow from the individual well is diverted from the bulk header into the test header. Testing is by means of automatic metering and recording devices.

Savings in manpower on this, one of the world's first fully automatic trap farms, promises to be of major proportions, according to the operator's engineers. The actuator used in this installation is a Pantex.



Time clocks control the valve actuators in this trap farm to facilitate well-testing routine.

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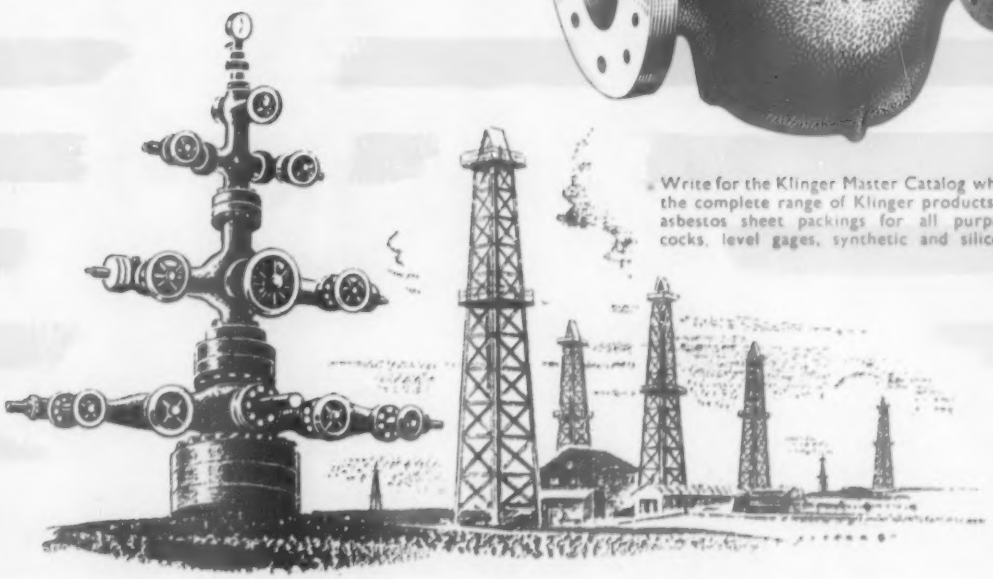

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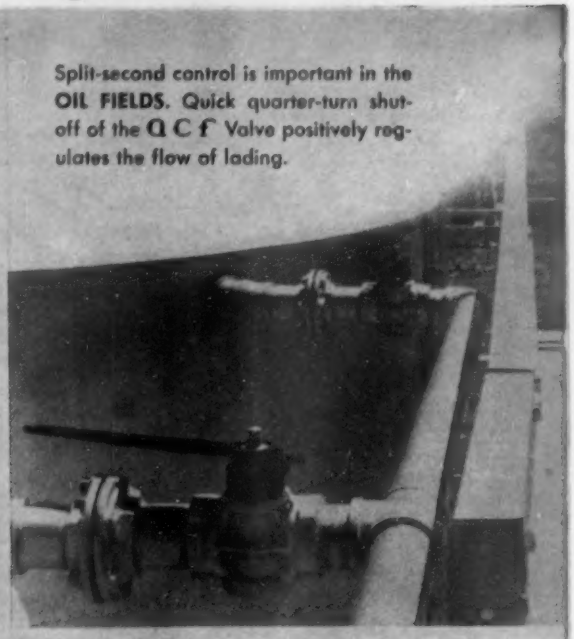

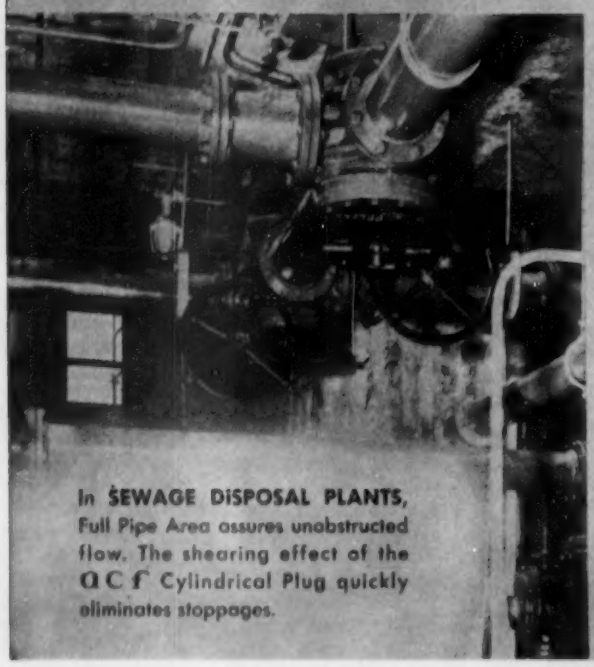

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Unsteady-State Flow in Gas Reservoirs—5

Back-Pressure Test on Gas Wells

by Dr. R. F. Nielsen

CUSTOMARILY, performance of a gas well is tested by flowing at a series of constant rates and determining bottom-hole flowing pressure p_w at each rate. A "back-pressure curve" or a plot of $p_e^2 - p_w^2$ against q on log paper is made, where p_e is static shut-in pressure and q rate in standard cubic feet per unit time.

According to steady-state formula, which assumes isothermal flow and validity of Boyle's and Darcy's laws, a 45° straight line should be obtained, represented by:

$$q = C(p_e^2 - p_w^2) \qquad (1)$$

where C is a constant depending on the gas and porous medium, well radius, and drainage radius. In general, a test cannot conform to assumptions of Equation 1, and the back-pressure curve is commonly given:

$$q = C(p_e^2 - p_w^2)^n \qquad (2)$$

where n is nearly always less than unity.

Failure of Equation 1 is attributed in most cases to turbulence near the well and to a varying radius of drainage during measurements. Departure from steady state near the drainage radius and departure from Boyle's law might affect n, as might varying liquid saturations and other inhomogeneities.

A general equation[1] combining viscous and turbulent velocity ranges for radial flow is:

$$dp/dr = av + b\rho v^2 \qquad (3)$$

where v is linear velocity, r is radial distance, ρ is density, and a and b are constants for the fluid and porous medium. Velocity at any point is proportional to q/rp, and ρ is proportional to p. Substituting and integrating gives, for steady state (q constant):

$$(p_e^2 - p_w^2) = c_1 q \ln (r_e/r_w) + (c_2 q^2)/r_w - (c_2 q^2)/r_e \qquad (4)$$

where c_1 and c_2 are constants, r_e is drainage radius, and r_w is well radius. The last term is negligible. Relative importance of the terms in q and q^2 depends on the magnitude of q, c_2 being very much smaller than c_1. The n in Equation 2 can vary from unity to as low as 0.5 through a range of very high rates.

When a well is suddenly opened to constant production after shut in, a transient drainage radius is formed which increases with time. Velocity of the transient boundary and pressure distribution within it were worked out by Bruce et al.[2] assuming Boyle's and Darcy's laws. Pressure distribution deviates considerably from steady state; that is, p^2 is not a linear function of log r.

Results of Bruce et al. was given in Installment 3 of this series.[3] A rate of 90 million standard cubic feet per day for the reservoir described was shown to correspond to Q = 0.1, Q being the reduced rate. The transient traveled 20 ft. in 7 seconds, 60 ft. in 47 seconds, and 4,000 ft. in 2.44 days. If we consider a rate of 9 million standard cubic feet per day, or Q = 0.01, then transients are at 20 and 60 ft. (see figure in Installment 3) at a somewhat lower fractional depletion (F = 0.0006 and 0.004 as compared with 0.0009 and 0.006).

Considering the rate is only one-tenth the previous example, times required for transients to go 20 and 60 ft. are 47 and 313 seconds. The curves of Bruce et al. indicate, at lower rates, time required for the transient boundary to go a certain radial distance is inversely proportional to rate.

With an "isochronal" method[4] of obtaining back-pressure curves, the well is shut in between each measurement, and bottom-hole flowing pressure for each rate is taken the same length of time after the well is opened to that rate. It is of interest to determine slope of the performance curve from calculations of Bruce et al., using the two rates given above and assuming bottom-hole pressure could be determined 47 seconds after flow started. Well pressures P (relative to shut in) are 0.88 and 0.988 from the figure referred to. Thus $1 - P^2$ is 0.226 and 0.024, so that n in Equation 2 is close to unity, assuming no turbulence. Cullender[4] found breaks in the curves from one well, indicating a change from purely viscous flow at a certain rate. Theory of the isochronal method is data taken with a constant drainage radius. Curves of Bruce et al. indicate that to have a constant drainage radius, data should be taken at constant total production.

In preceding discussion, radius of drainage has been considered to be the boundary beyond which pressure is essentially constant, provided this boundary has not reached outer boundary of the reservoir. A theoretical definition is useful,[5] as shown by Fig. 1. The curve showing p^2 as a function of log r is straight near the well if there is no turbulence and other conditions are met. Toward the outer boundary the curve becomes horizontal. Theoretical drainage radius is the value of r corresponding to extrapolation of the straight-line portion to leveled value of p_e^2.

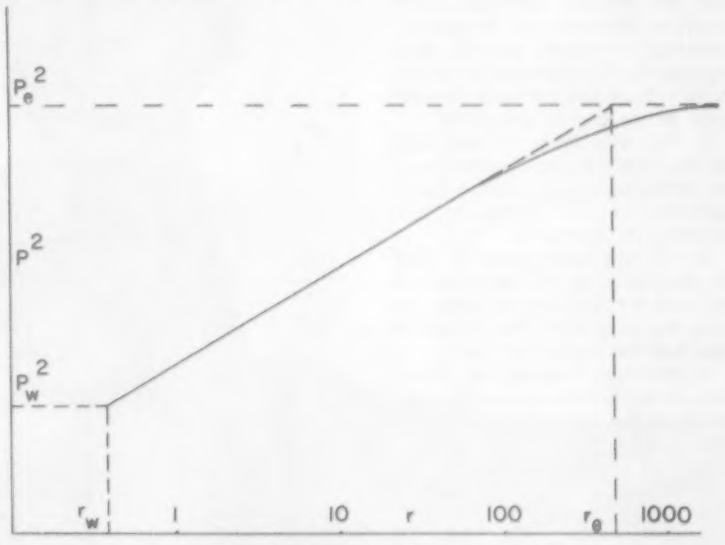

Fig. 1—Theoretical radius of drainage (after Cornell).

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3. Nielsen, The Oil and Gas Journal, Dec. 6, 1954.
4. Cullender, Paper No. 330-G, A.I.M.E., 1953.
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Author is associate professor of petroleum and natural-gas engineering, Pennsylvania State University.

ELECTRIC LOGGING—46

S.P. Log Response in Sand and Shales

by R. I. Martin

THE selective S.P. and static S.P. logging were designed for locating permeable beds in limestone. It is interesting, however, to consider their response to soft formations such as a sequence of sands and shales. The essential features are:

1. The selective S.P. and static S.P. logs, on the average, show sharper breaks at the levels of the boundaries of the beds, than the conventional S.P. log.

2. The ability of the new methods to locate thin beds depends on the electrode spacing. If the individual bed thickness is so small that several of them are included within the over-all spacing, it is difficult to differentiate these layers. If the beds are very thin, only one average deflection is obtained. Consequently it would appear that small spacings should be used.

Too short a spacing, however, may give too small deflections on the selective S.P. curves, because of the influence of the mud. As for the static S.P. log, it is theoretically possible to decrease the spacing so that the thinnest individual layers could be differentiated. In practice, however, it is found that the spacing may not be decreased too much. A very small spacing leads to instability of the logging equipment.

3. The magnitude of deflections on the static S.P. log is a function of the electrode spacing, and of the resistivities of the formations surrounding the electrodes.

4. For very thick permeable beds, the magnitude of the deflections of the static S.P. log from the shale line, gives the static S.P. This is also the case with the regular S.P. log.

A difference between the magnitude of the deflections, and the true value of the static S.P. begins to occur for thin beds. As a rule, however, this difference is less than the difference displayed by the regular S.P. log.

This is illustrated in Fig. 1. In the case of the thin bed, e = 2 d, the deflection of the static S.P. log is almost equal to the true value of the static S.P. In contrast the regular S.P. curve gives a much smaller deflection. For e = 4 d and e = 8 d, the deflection of the static S.P. log becomes greater than the true static S.P. whereas the conventional S.P. deflection is smaller. For e = 16 d the shape of the static S.P. curve is more complicated. Instead of one single peak, the curve shows a central depression bounded by two symmetrical peaks (a) below and above the upper and lower boundaries. The magnitude of the deflection at the level of the depression is approximately equal to the static S.P.

A similar shape would be obtained for thicker beds. The curve will show a plateau corresponding to the static S.P. and the two peaks will remain at the boundaries. Other boundary effects are the sharp depressions (b) which occur above and below the boundaries, whatever the thickness of the beds.

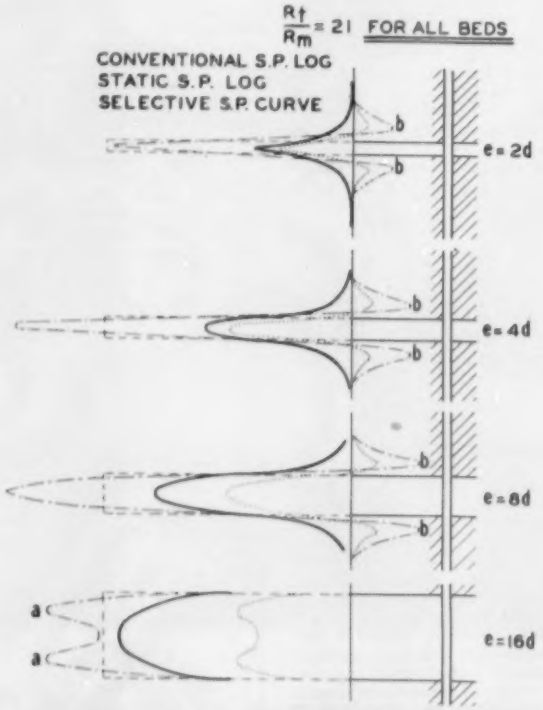
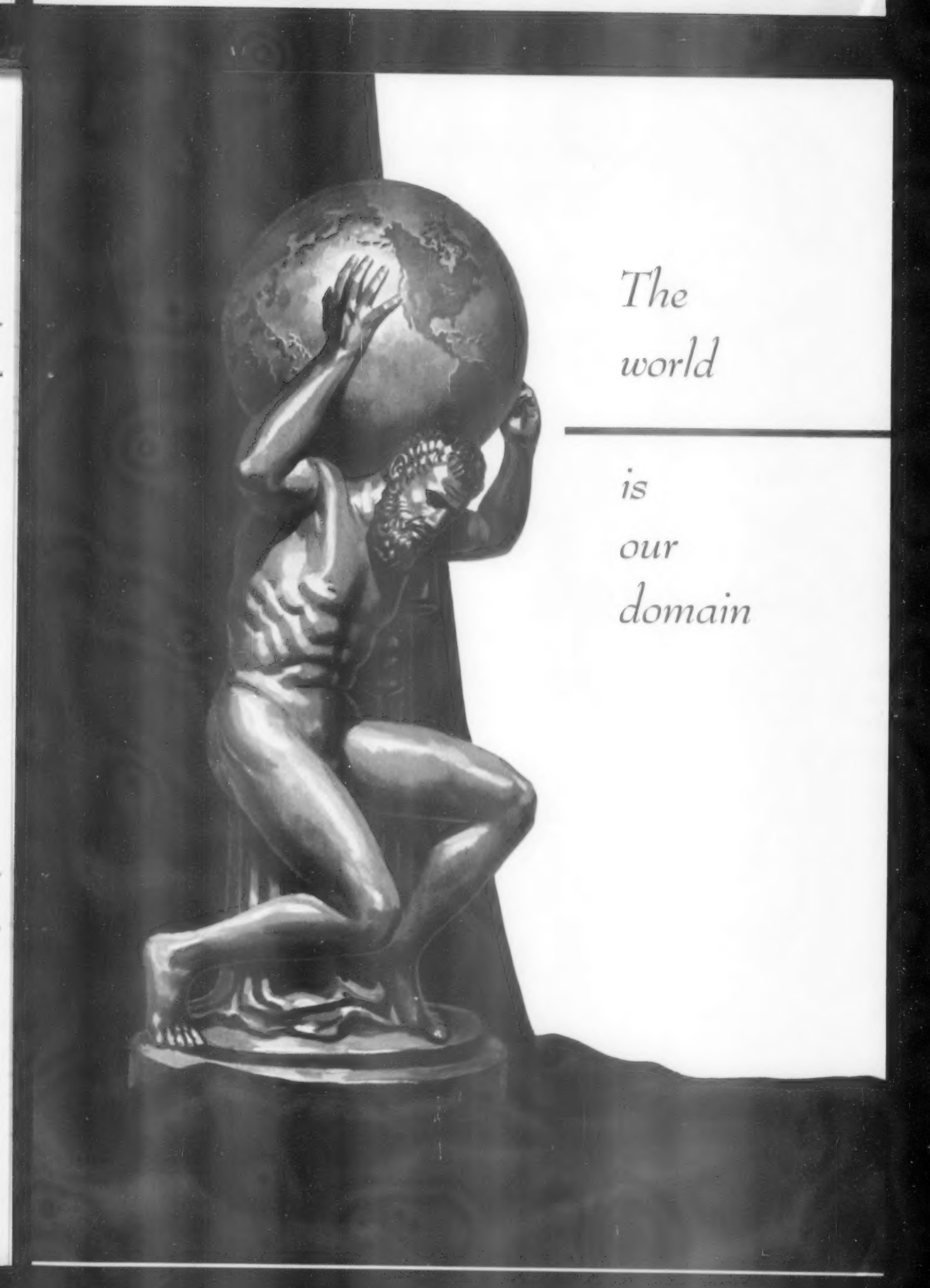


Fig. 1. The selective S.P. curve opposite sands. The difference between the magnitude of the deflections and the true value of the static S.P. is less than the difference displayed by the regular S.P. log.

Author is assistant professor of petroleum engineering, Missouri School of Mines and Metallurgy.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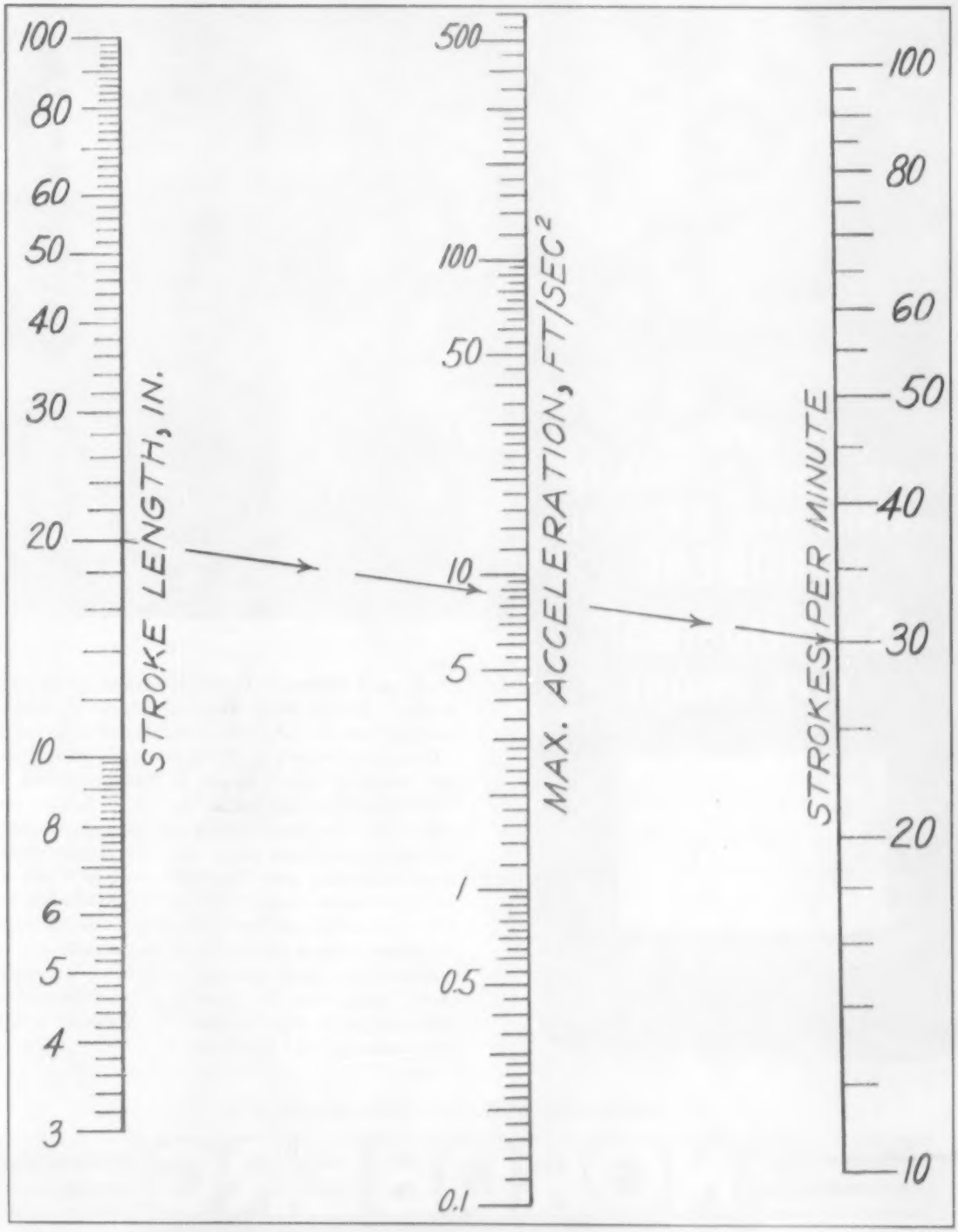
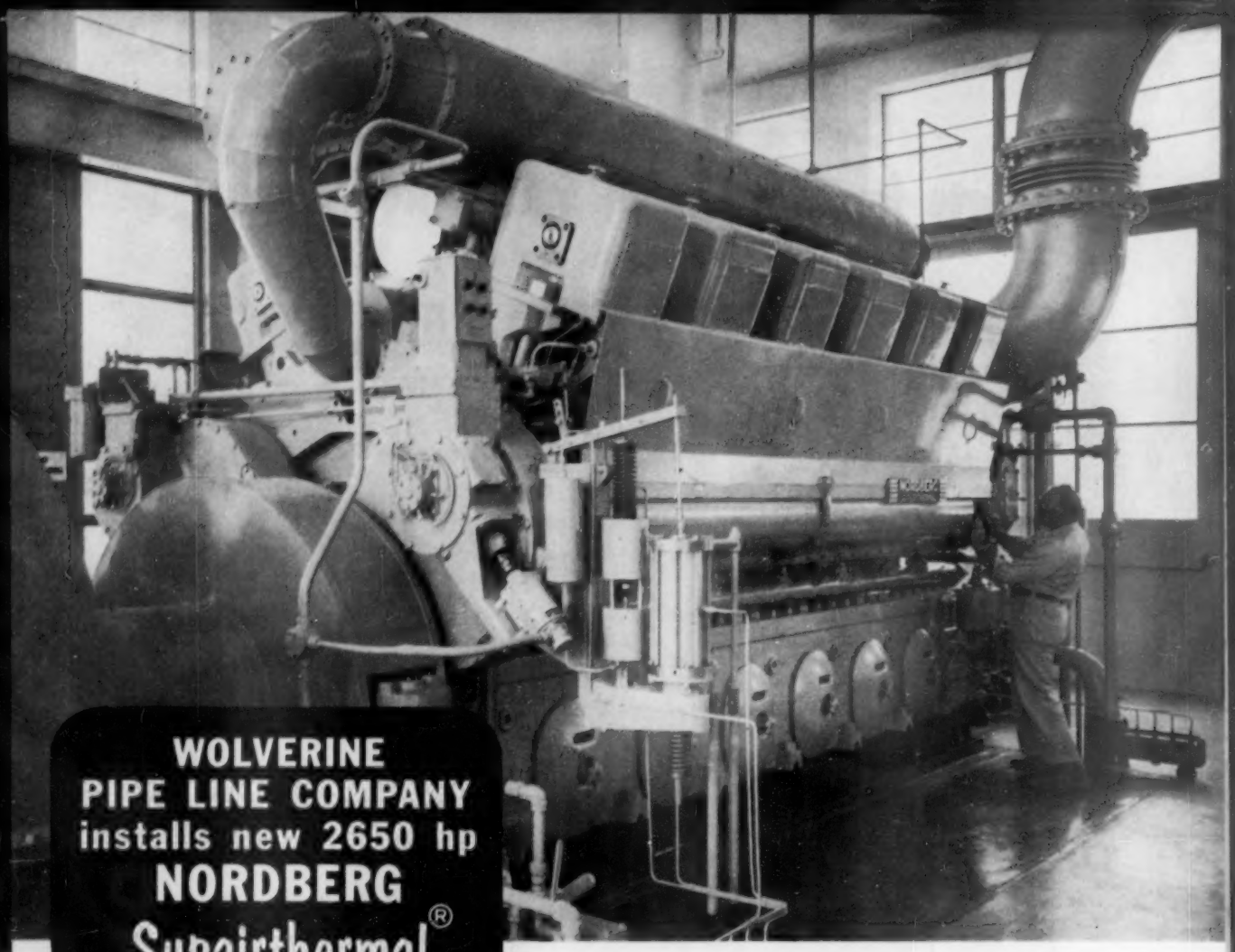
Charts for Simplifying Sucker-Rod Analyses—3

by Louis J. Murphy





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How to Design In-Tank Jet Mixing Systems—11

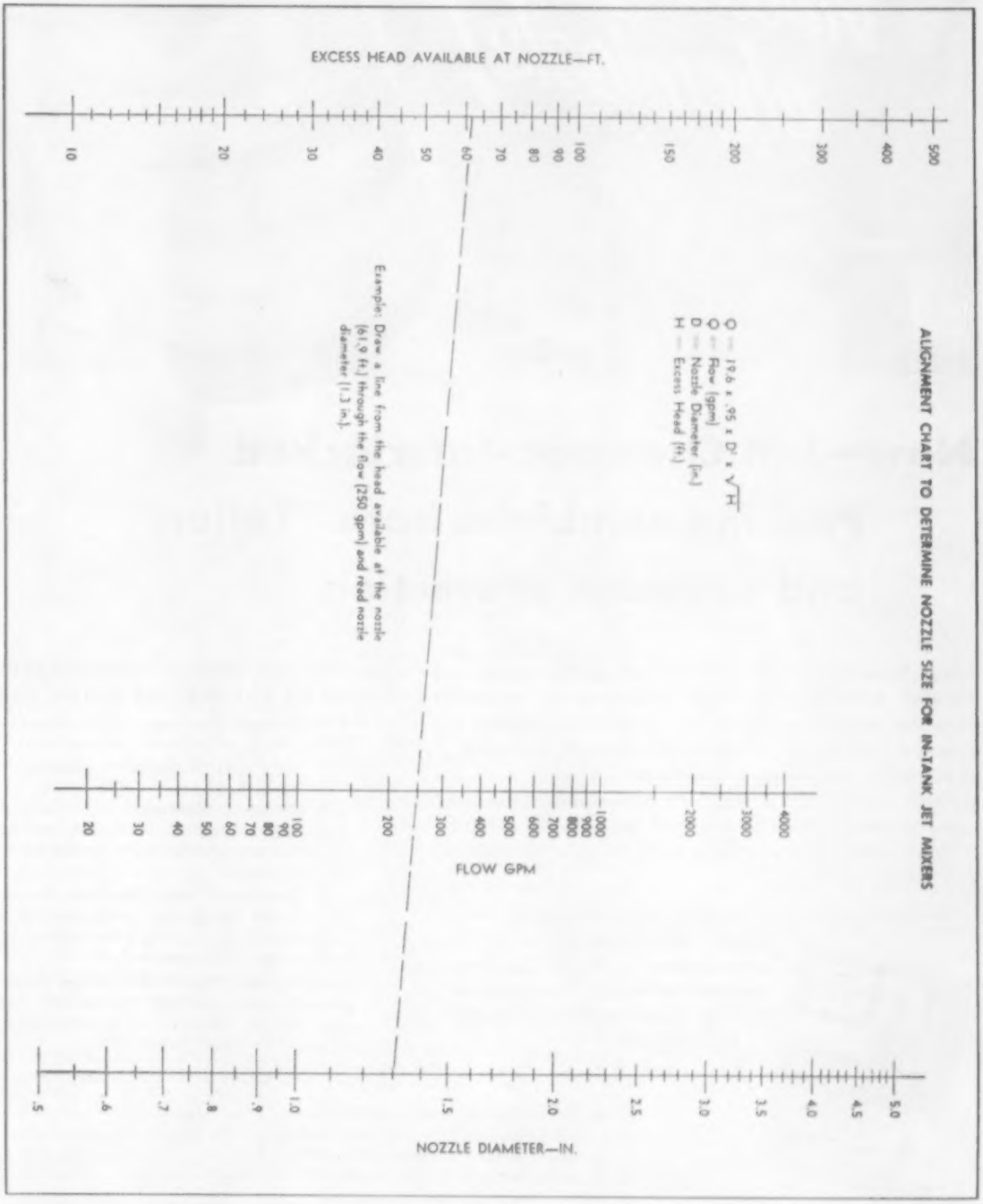

Fig. 7.

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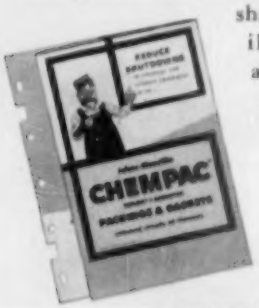

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by T. E. Raper

How to Do a Safer Job of Loading—3

• This series is concluded here with more comment on tank-car loading and the tools required for loading and minor maintenance.

WHEN loading through the vent valve, which most operators are now doing, open the two loading valves with the plug in tight to be sure the diaphragm does not leak. The unloader will have to use these valves and if the diaphragm leaks, he is in trouble.

Repairs can be made to the Rego valve without removing the valve body from the car.

To change the diaphragm or valve disk, remove the eight bonnet cap screws, then the diaphragm valve stem and guide can be removed and replaced as necessary. If the car is loaded and repairs are necessary, open the valve as fast as possible. The check valve located under the dome flange will check the flow or leak, then repairs can be made or the valve replaced.

As the valve is replaced, be sure the valve being applied is left open until firmly bolted to the dome flange. On the AC&F-type valve, the only repairs that can safely be made to this valve on the car is to tighten the packing-gland nuts. If the valve is leaking at the seat, it must be removed from the car and ground in or replaced.

Flange leaks . . . The loading and vent valves, safety valve, and slip-tube flange are bolted to the dome with four ¾-in. studs to each flange. The lead gaskets are in a recess under each flange. If a leak develops under these flanges, loosen the flange nuts slightly and tighten them evenly. This usually stops the leak. A leak around the dome flange can be stopped by tightening the dome-flange bolts.

Packing . . . The slip-tube packing-gland assembly should be checked to make sure there is plenty of packing. If there are no threads on the packing flange, packing must be added. If for any reason the car is loaded and packing must be added to the slip-tube packing gland, this can usually be done easily. There is a repack ring located just above the stop on the slip tube. Pull the tube up as far as it will go, forcing the repack gasket tight against the flange. This usually seals the pressure off the packing gland. Then it is safe to proceed with the packing operation.

If the repacking gasket does not seal off, it will be quite a job to add packing. Usually only a temporary repair can be made by adding a ring or two of rope-graphite packing just above chaser, then replacing packing-nut gland. This will usually keep the packing gland from leaking while the car is in transit. The gland should be repacked when the car is unloaded.

Author is with Warren Petroleum Corp. at Maysville, Okla. Paper presented at N.G.A.A. meeting, Oklahoma City, September 17, 1954.

Pressure test . . . When a repair is made on any empty car, it is a good practice to pressure-test the car before loading. After the test is completed and the car seems to be in safe order, the gas used for testing should be vented off through the recovery system or vent line. Minor repairs and adjustments can safely be made by the loading-rack men to the tank-car loading facilities if they are properly instructed and provided with proper supplies.

The first thing a loader should do before attempting to load any car is to give the facilities in the manway a thorough inspection, checking for leaks or any faulty equipment that is tagged. If any are found, repairs should be made and checked before proceeding with the loading. After a thorough inspection of the car, if all the car devices seem to be in proper order and the brakes are set, the hose may be connected and the loader may proceed with the loading. If any leaks develop before or during loading and equipment cannot be repaired by the loader, cars should be vented or unloaded and sent to the car shops for repairs.

Checking outage . . . A caution to the loader when he is checking the outage: never lean over the gaging device during the gaging operations. Remember that it is under pressure and may rise rapidly, resulting in injury to the head or body.

Another good loading practice is the placing of tank-car-loading signs at each end of the loading rack. Another is the locking of the derail bar so that it is impossible for cars or switch engine to enter the loading area during the period when loading is in progress.

Proper grounding or static wire should be used and connected to the tank-car holddown strut. The loader should remain in attendance during the loading operations. If a leak develops, the loading should be suspended till the proper repairs are made. After the loading has been completed, the outage rechecked to make sure it is correct, the hose disconnected, and all valves closed and plugs properly tightened, the dome cover may be closed and tank-car seals applied.

Tools for Loading and Minor Repairs

One 10-in. pipe wrench for the slip-tube valve.
One 10-in. crescent wrench for slip-tube valve.
One ¾-in. crow-foot socket with ¾-in. drive for valve-flange bolts.
One No. 637, 1¼ by 1⅛-in. Williams thin wrench for safety-valve gaskets.
One 2-in. OTCED-3132 open-end wrench for packing nuts.
One 1⅛-in. socket, ¾-in. drive for dome-flange bolts.
One 16-in. extension for ¾-in. drive.
One ⅞-in. socket, ⅜-in. drive to repair Rego valve cap screws.
One ⅞-in. socket, ¾-in. drive for Rego valve flange screws.
One speed handle, ¾-in. drive.
One oil can.
Two or more hammers, nonferrous type.

Location . . . In the safe operation of a loading rack, location is a very important factor. The area should be free from dwellings or other surroundings where open fires might be a hazard. The type of heating used in the buildings on or around the rack should be of the enclosed type. Another must at the loading rack is a vapor-recovery system, or an enclosed vent system, so that it will not be necessary to vent the hose or car to the atmosphere.

References

1. Handbook, Butane-Propane Gases.
2. Safe Practices for Loading L.P.G. Into Tank Cars and Trucks, as recommended by the Natural Gasoline Association of America.
3. Instructions published on the loading of tank cars by Warren Petroleum Corp. and other oil companies.

TOPS IN OIL FINANCING!

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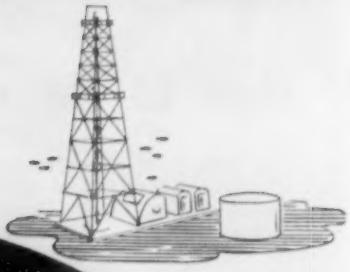

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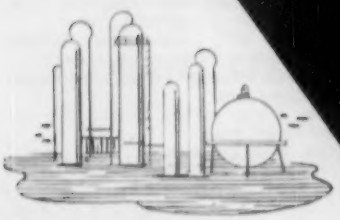

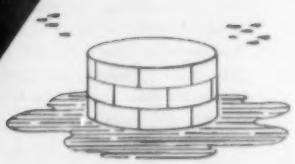

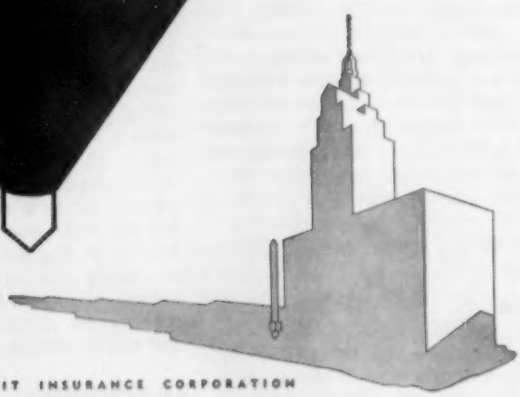

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by W. L. Nelson
Technical Editor

PROGRESS IN METALS

Application of Metals and Alloys in Petroleum Refining

Part 4

THE applications and services listed in recent and the next several installments summarize much of the material published on the Progress in Metals page since January 1953. The compositions of the various alloys or steels listed here were published in the form of an alphabetized list in the issues of September 14, 1953-January 4, 1954.

Any listing of applications will obviously be incomplete and note especially that the most common materials such as gray cast iron, malleable iron, carbon steel, ductile iron, brasses, bronzes, etc., are seldom listed even though they may be used more widely than the alloys or alloy steels.

Equipment, Corrosive Agent, or Service	Some of the Materials that have been Employed*†
Fly wheels	0.75 Cu cast iron
Foamite solutions	Aluminum bronze
Fractionating towers	Steel, Types 502, stainless, Monel, linings of Types 405, 316, etc., and (See Vessels)
Fractionating trays	(See bubble trays and fractionating towers)
Fume ducts (sulfur di and trioxide)	Aluminum alloys
Furnace castings:	
Oxidizing and sulfidizing atmosphere	HC, HD, HE, HF, HH, HI, HK, & HL Cr-Ni steels
Reducing atmospheres	HT, HU, HW, & X Ni-Cr steels
Insulated and to 600° F.	Gray iron
to 1,000° F.	Meehanite & Ni-Cr cast iron
to 1,400° F.	Scale-resisting and Ni-Resist cast irons
1,900 - 1,950° F.	D 28-5 or HE 29-9 Cr-Ni steels
2,000 - 2,050° F.	HH 25-12 or HK 25-20 Cr-Ni steels
to 2,100° F.	HL 30-20 Cr-Ni steel or Nichrome IV 20-80 Cr-Ni alloy
Furnace-return bends-	(See furnace tubes for similar compositions)
moderate temp.—low strength	0.3 carbon steel
moderate temp.—high strength	0.5 carbon moly, carbon moly silicon, and Cr-Ni moly steels
High temp. corrosion resistant	5-9 per cent Cr moly steels and stainless steels
Abrasion resistant	1.0 Cr, 0.15 Va steel
Furnace tubes:	
Scales at 1,050° F.	Killed carbon, carbon moly or silicon moly steels
Scales at 1,100 ° F. high strength	1¼ Cr, Si, Mo steel
Scales at 1,150° F. high strength	2 Cr moly steel
Scales at 1,200° F. sulfide resistant	2 Cr, Si, Mo; 5 Cr moly; or 7 Cr moly steels
Scales at 1,300° F. sulfide resistant	5 Cr, Si, Mo; or 9 Cr moly steels
Scales at higher temp. sulfide resistant	Stainless steels
Furnace tube sheets	(See Furnace castings)
Furfural:	
Condensers or exchangers	Aluminum alloys, Alclad
Regeneration tower	Monel, nickel, Type 502 stainless steels and Ni-Resist cast iron
Gage glasses or hydrofluoric acid	Phosphate glass
Gas oil:	
Condenser tubes	Aluminum alloys, Alclad
0.6—0.8 per cent C—450° F.	Types 502 or 410 stainless steel
Gaskets (return bends)	Copper, iron or aluminum metals and stainless iron
Gears:	
Heavy duty	Carb. 4620 or 4820 steel
Diesel	Ni-Cr-Mo cast iron
Glycolamine—fractionators, exchangers, coolers, etc.	Aluminum alloys
Guide bolts (compressors)	H T 3140 steel
Hatches, vents, etc. (sour crude tanks)	Aluminum alloys
High temperature strength	(See Creep Strength)
Hydrochloric acid:	
Hot	Carbon (Karbate), silver metal (or cladding) tantalum metal and silicon moly irons (Durichlor)
Cold dilute	Nickel alloys, Hastelloy 9 & C, Illium, LaBour, Contracid, etc.
	Nickel alloys, Hastelloy D
	Iron alloys, Worthite, Circle L34, etc.
	Silicon irons—Duriron, Tantiron, Corrosiron
	Nickel and Tantalum metals
Very dilute and brines	Cupro nickel, nickel silver, monel metal, 25-12 stainless, Ni-Resist iron, Admiralty metal, aluminum bronze, etc.
with antimony trichloride	Nickel (or clad)
Hydrofluoric acid:	
Boiling 48 per cent	Carbon (Karbate), H or S monel castings
60 per cent at 185° F. or 100 per cent cold	Carbon (Karbate), H monel, or cupro nickels
Gage glasses for	Phosphate glass

*Abbreviations—Type (302, 316, etc.) means A.I.S.I. designations. Q and T means "quenched and tempered." H T means "heat treated." Carb. means "carburized and case hardened." Numbers as 3140, 2335, etc., refer to S.A.E. steel designations. Chemical elements—C, carbon. Ni, nickel. Cr, chromium; V, vanadium; Ci, silicon; Mo, molybdenum; Mn, manganese; HC, HE, HU, etc. are designations of the Alloy Castings Institute.

†Obviously, plain carbon steel, cast iron, brass, etc., are used for most services and they will not always be listed. Likewise, many materials have been omitted because their use has escaped notice.

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Among the Drilling Contractors

Wyoming Rig Drills Six Wells Without Accident

A record of having drilled six wells, totaling 38,108 ft. of hole and involving 53,720 man-hours of work, over a period of 18 months without a major shutdown for rig repairs and without a lost-time accident recently was set by crews on a rig operated by Mountain Fuel Supply Co. in the Green River basin of southwestern Wyoming and northwestern Colorado.

The wells, completed as gas producers, were in four different fields. Seven rig-moves were involved. Each crew averaged 120 miles of driving each day.

Crewmen, guests of W. T. Nightingale, Salt Lake City, Utah, president of the company, at a steak dinner at Rock Springs, Wyo., operating headquarters, were: Dale E. Dallas, drilling foreman; Joe M. Pivik, Harold G. Yenne, and John H. Zuehlsdorf, drillers; Dexter L. Bailey, and John A. Fortuna, Sr., derrickman; Louie Caller, Victor Dona, John Gatti, Eugene J. Magsamen, Fred D. Marchetti, Marion R. Sisemore, Douglas R. Stewart, and Lee R. Tyler, floormen; and Everet D. Daniels, Morris J. Feith, William E. Hill, and Berl W. Woodward, motormen.

Other guests included M. M. Fidlar, vice president; and L. W. Jones, safety supervisor.

Survey Drilling Co., Dallas, has the contract for another Lower Cretaceous test Gulf Oil Corp. has projected in Santa Rosa County, in the Florida Panhandle. Location, in 11-5n-29w, is a mile west of Jay, in the northern part of the county, on the trend southeastward from Pollard field, across the state line in Alabama. Survey will use the rig now on a Gulf wildcat test in Washington County, Alabama.

Jett Drilling Co., Shreveport, is starting another well for Stanolind Oil & Gas Co. in the new Lake Mary field, northeastern Wilkinson County, southwestern Mississippi. The well, 2 Stafford, is a location west of Stanolind's recently completed initial well, 1 Stafford.

Edwards & Bissett, Almeda (Houston), Tex., will drill for Houston Oil Co. of Texas at an outpost location 4,500 ft. east of Juanita field, in Beauregard Parish, southern Louisiana. Location is for 1-A Newport, a projected 8,000-ft. test. This is the fourth well for the field, which produces from two sands, one at 7,500 ft. and the other at 7,800 ft.

PLD Well Service Co. is contractor on a 4,400-ft. wildcat test Sam G. Harrison, of Houston, is putting down at 1 Wolters, 5 miles northeast of Charco, in Karnes County, South Texas.

Grey Wolf Drilling Co., Houston, has a new wildcat operation under contract for General Crude Oil Co. It is a projected 9,000-ft. test 5 miles northeast of Baton Rouge, in East Baton Rouge Parish, southern Louisiana. Location is listed as 1 Jones, in 43-6s-1e.

Chester H. Westfall Drilling Co., Tulsa, is starting work on a Hart sand

Crewmen on Mountain Fuel Supply Co. rig which drilled six wells without major shutdown for rig repairs and without lost-time accident. Picture taken at dinner given by W. T. Nightingale, president of the company, in recognition of their achievement (see story above).

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test for Superior Oil Co., in the C SW NE 19-4n-3w, near Lindsay, on the west side of the Golden Trend, in northwestern Garvin County, Oklahoma. The test is Superior's 1 Bullock.

Mountain States Drilling Co., Denver, is under contract to Superior Oil Co. for a wildcat test in the Sherard area, 12 miles east of Worland, in Washakie County, Wyoming. Location is for 1 Chittum, in 29-47n-90w.

Glasscock-Wilson, Inc., will drill a 12,500-ft. test for Seaboard Oil Co. at 1 Picard, in 13-11s-3w, 10 miles north of Abbeville, Vermillion Parish, Louisiana Gulf Coast.

Del Mar Drilling Co., Corpus Christi, is under contract for a 9,200-ft. test a mile east of Swan Lake field, 5 miles south of Vanderbilt, in southern Jackson County, Texas Gulf Coast. R. E. Hibbert, of Houston, is the operator. Location is at 1 Hensley, in the Josiah Bell Survey.

Bryan Patterson will drill a projected 2,650-ft. test for C. W. Fenstermaker, of San Antonio, at a wildcat location ½ mile south of Luling, in southern Caldwell County. Designation is 1 Zedler, located in the Benjamin Fuqua Survey.

Milton Crow, Inc., Shreveport, has contracts for three wells which Lyons, McCord & Logan, of Shreveport, will drill in the Kiblah area, Lafayette County, southwestern Arkansas. All the wells, to be drilled consecutively, will be carried to the 6,100-ft. Mitchell sand, productive in that area. Drilling is getting under way at the first location, 1 Edward, in 2-20s-26w.

M. J. Delaney Co., Dallas, is under contract for a 9,200-ft. wildcat test located in the J. Marrs Survey, 3 miles west of Grand Saline, in Van Zandt County, East Texas. It will be drilled for R. J. Caraway, at 1 Happonstall.

Kee & Simpson and **Miller & York** have the contracts on two wildcat tests Standard Oil Co. of California will drill on the west side of San Joaquin Valley, in southwestern Kern County, California. The former will drill Standard's 52 33Z, in the Shamrock anticline area, near McKittrick. The latter will drill 63 3K, east of Midway-Sunset field, 4 miles east of Maricopa. Contract depths are 6,500 ft.

Prince Drilling Co., Houston, is drilling for Greenbrier Oil Co. at 1 Gayle-Smith-Badge, a newly started deep test in the Bailey's Prairie area, 7 miles west of Angleton, in Brazoria County. Hole is projected to 11,400 ft.

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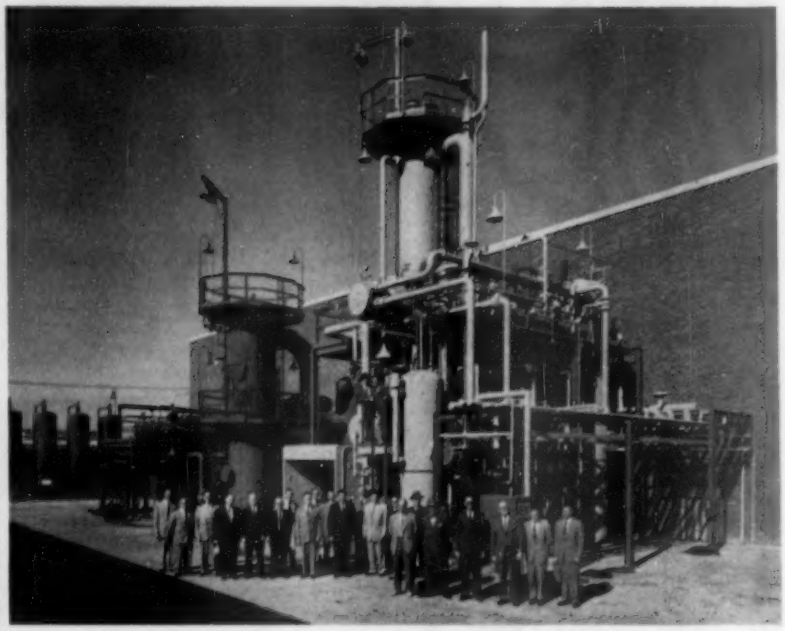


Experimental Plant Opened

ALHAMBRA, Calif.—A new experimental distillation plant that will be used by Fractionation Research, Inc., to study the performance of fractionating equipment was inspected here recently during a 3-day executive and technical session for FRI members.

The new experimental plant was designed and constructed by C. F. Braun & Co. It is located adjacent to Braun's research center here. An engineering and operating staff for the plant will be provided by Braun.

The nonprofit research group is hoping to determine the effects of tray design, system proportions, and operating conditions on capacity and tray efficiency. Basic information is expected to be developed that will result in:

. . . **Revamping equipment** for increased capacity or better separating efficiency.

. . . **Designing columns** that are less costly, more flexible, reliable, and effective than present columns.

The 66-in., three-tray simulator column at the experimental plant will be used as a screening device for testing bubble cap trays and other contracting devices. The most promising trays will then be studied in the 48-in., ten-tray distillation column.

The research organization is composed of representatives of 43 chemical, petroleum, and engineering companies. By forming the organization, the group will be able to tackle research problems that were too costly for any individual firms to finance.

The FRI research program will include three principal phases:

. . . **Investigation of various** distillation devices by means of the so-called simulator column.

. . . **More exhaustive study** in the new plant of those devices that show promise in the simulator test.

. . . **Full-scale tests** of actual plants to check and extend the experimental data.

Shell Platformer Operating

WOOD RIVER, Ill.—The third Platformer built for Shell Oil Co. has gone on stream at the company's refinery here.

The 16,000-bbl. unit is processing naphtha which boils in the range of 190° to 360° F. The naphtha is processed in the Platformer from mixed crudes. The unit is producing 95 leaded octane Platformate for a motor fuel blending material.

Shell also operates a 16,000-bbl. unit at its Houston refinery and a 5,000-bbl.

Platformer at its Martinez, Calif., refinery.

All the units were designed, engineered, and licensed by Universal Oil Products Co. Procon, Inc., was the contractor on the Wood River and Houston jobs.

Clark Platformer Finished

BLUE ISLAND, Ill.—Clark Oil & Refining Corp. has placed a 5,500-bbl. Platformer on stream at its refinery here.

The unit, designed, engineered, and licensed by Universal Oil Products Co., is the first commercial Platformer in the Chicago area. The entire production of the reformer will be used as part of a blended motor fuel of 94 leaded octane which Clark will market under its brand name.

The unit has produced gasoline of 100 octane leaded and is processing straight-run gasoline derived from crude which is piped in from North Texas, Oklahoma, Colorado, and Wyoming.

Clark officials have also announced the opening of the first of 25 new service stations which the company is building in the city of Chicago. Clark has never marketed its products in Chicago before. Previous marketing centers for the company have been located in Missouri, Minnesota, and Wisconsin.

The unit was constructed by Procon, Inc., in the unusually fast time of 162 days.

Imperial Lets Poly Unit

VANCOUVER, B. C.—Imperial Oil, Ltd., has let a contract for a 2,400-bbl. catalytic polymerization unit at its Loco refinery near here.

Bechtel Corp. will start work on the unit shortly after the first of the year. Completion date is set for next September. In addition to the U.O.P. cat poly unit, work also will be started on installation of a naphtha fractionator.

Tax Write-Off Granted

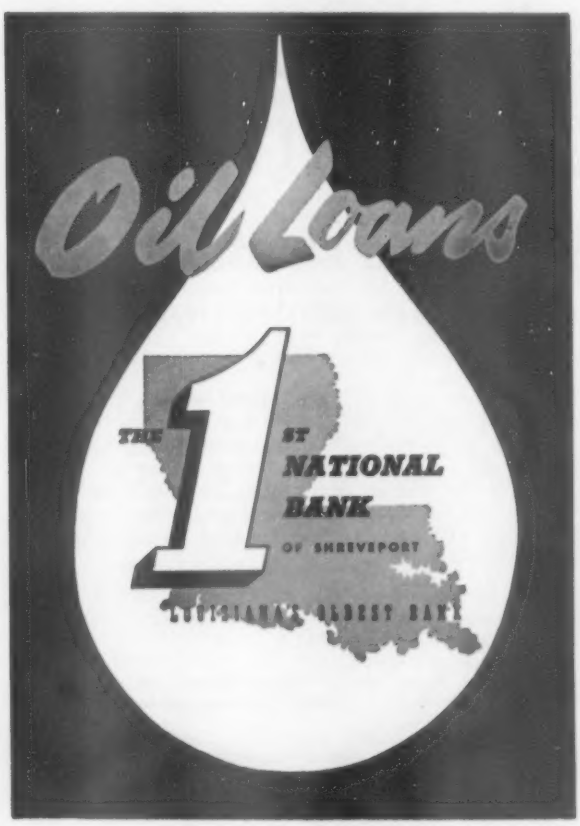
WASHINGTON.—Frontier Refining Co., of Denver, has received an Office of Defense Mobilization accelerated amortization on a $1,500,000 project at its Cheyenne, Wyo., refinery.

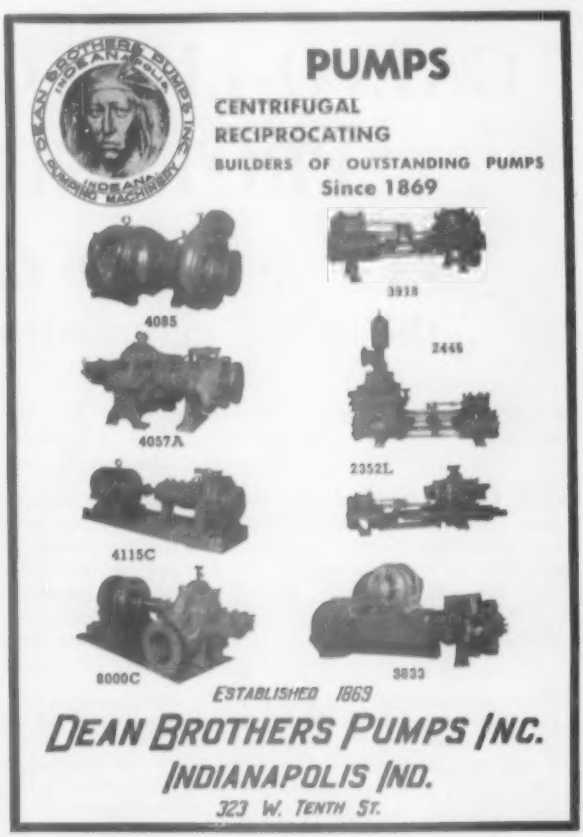
The rapid tax write-off will cover a 2,000-bbl. catalytic reforming unit, a 3,000-bbl. desulfurizing unit, six storage tanks with a combined capacity of 155,000 bbl., and auxiliary facilities at the refinery.

The company will be allowed 65 per cent of the $1,100,000 which will be spent for basic facilities and 45 per cent of the $400,000 for auxiliary equipment.

The company recently expanded its market by building a 220-mile, 6-in. products line from Cheyenne to North Platte, Nebr. Wyoming-Nebraska Pipe Line Co., a subsidiary of Frontier will operate the line.

"Naw, he ain't really gonna dive—It's just for a gag."





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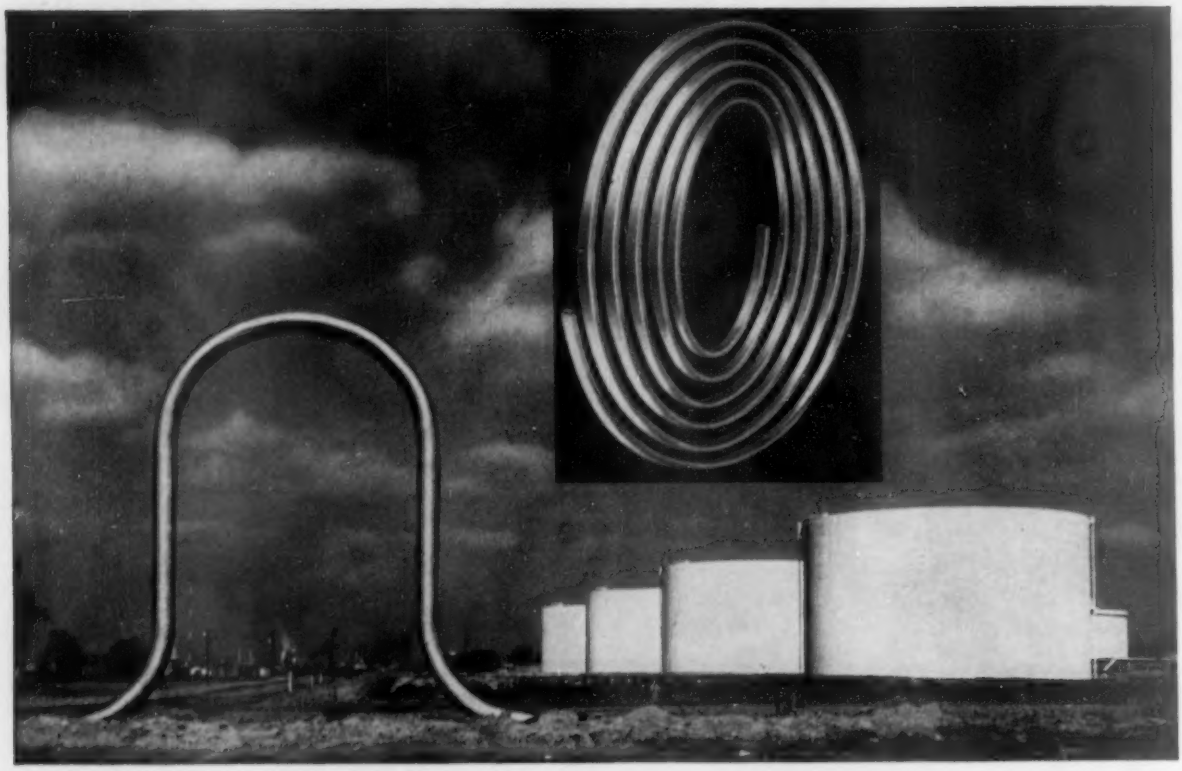

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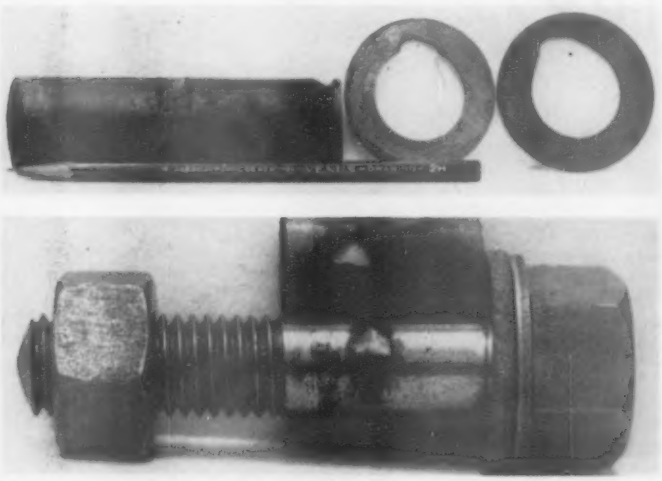

FIG. 1 (Top)—Effect of high-voltage surges on insulating flange components; note how the steel washer and insulating washer were severely burned. FIG. 3 (Bottom)—High-voltage surges caused this puncture of the thin dielectric material and ended the effectiveness of the unit.

FIG. 2—This closeup of the steel washer shows the loss of material caused by high-voltage surge. Too great to be caused by lightning alone, this damage was heightened by commercial fault currents.

In designing pipeline insulating joints, here's what's effective in . . .

Preventing damage from high-voltage surges

by Hugh L. Hamilton

TODAY'S increased use of high-quality protective coatings and cathodic protection demands that more attention be given to the engineering design of insulating joints. The low d.c. voltages which normally appear at insulating joints have caused some dubious thinking concerning the joint's electrical requirements. Insulating joints can be, and are, affected by extreme values of potential which may be many times higher than the normal operating voltages.

These abnormal voltages are a.c., the result of commercial electric power, or the natural phenomena of lightning. It is impractical to attempt a design to fully withstand these destructive forces, but the design should be such that their occurrence will not cause complete loss of the electrical effectiveness of the insulating joint. It is very important that this effectiveness be maintained since its loss will allow corrosion currents to run rampant or will alter the designed operation of the corrosion-control scheme.

Author is president of A. V. Smith Engineering Co., Narberth, Pa. Condensation of a paper presented at the annual convention of the American Gas Association, October 11-13, 1954, Atlantic City, N. J.

Physical properties . . . The insulating materials for insulating joints must have: (1) high dielectric characteristics that will be maintained for long periods of time; and (2) the proper mechanical characteristics to withstand pipeline movement and its accompanying stresses.

Experience over many years has shown the best thickness of dielectric material to be ⅛ in. Joints constructed with such material have undergone extreme voltage conditions while in service and, though charred, did not fail completely.

So far, the best material for the dielectric parts is a fabric-base laminated plastic of National Electrical Manufacturers Association or American Society of Testing Materials Grade C. The material has a tensile strength, with the grain, of 10,000 psi. and a compressive strength in the flat-wise direction of 40,000 psi. The dielectric strength is 150 volts per mil.

In order to adhere to the use of ⅛-in. dielectric material in flange joints, a reduction in diameter of the stud or bolt is required. This reduction requires the use of an alloy-steel stud for adequate tensile strength. Bolts of grade B-7 steel, A.S.T.M. designation A-193, a heat-treated steel, have been used with success. Heat-treated hex nuts of A.S.T.M. designation A-194, Class 2-H should be used with the bolts. The alloy bolt has a higher tensile strength than that which it replaces.

The gasket between the flange faces should be cut so that its inside diameter is smaller than the inside diameter of the flanges by ⅛ to ¼ in. The resulting protrusion within the pipe will cause local turbulence which will prevent accumulation of rust or other conductive particles which might electrically short-circuit the flanges. When the proper dielectric material is employed for this gasket, a scraper will pass the restriction without doing damage.

Voltage magnitudes . . . In the normal operation of insulating joints, voltages encountered are of minor magnitude, 5 volts being high and 25 volts being an extreme. Of considerable interest, however, are the excessive voltages which may appear across the joint as a result of lightning storms, commercial fault currents, induced voltages from adjoining power lines, magnetic storms, etc. These voltages can reach values

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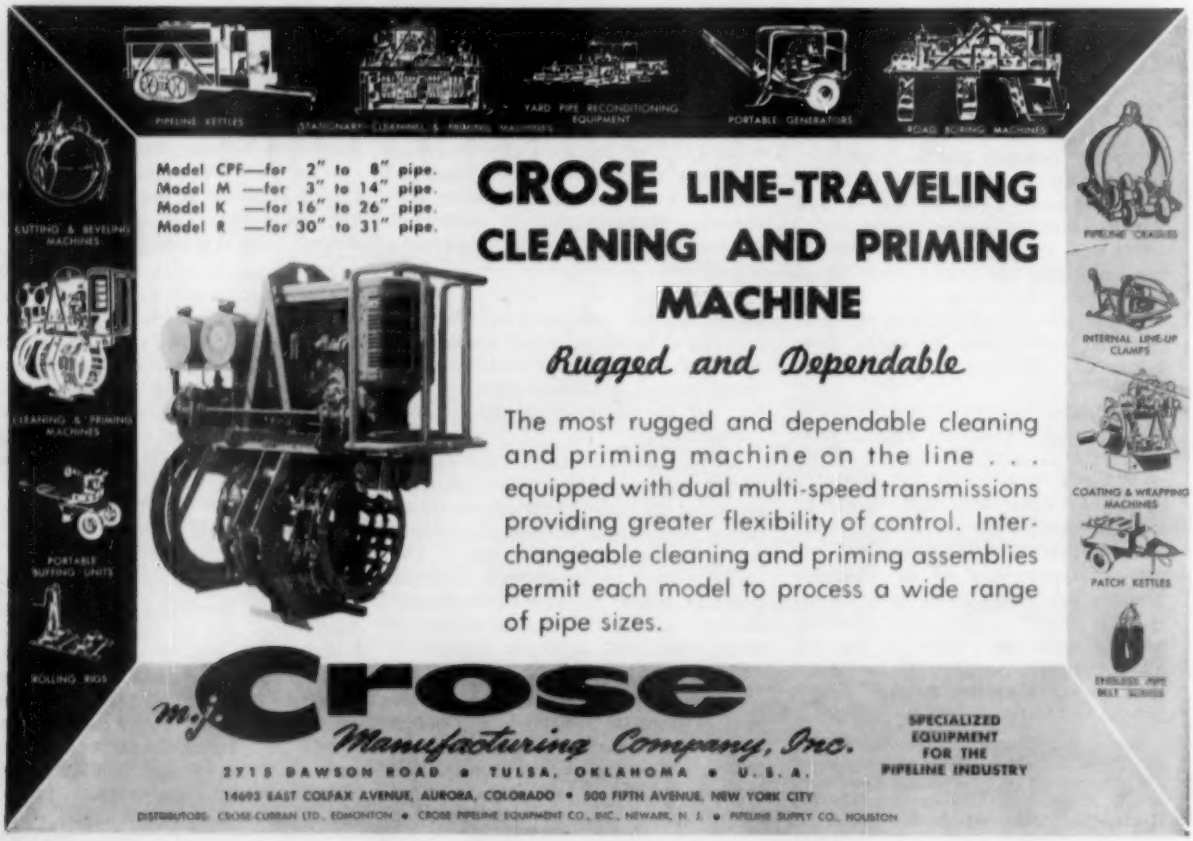
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FIG. 4—High voltage effects on an insulating-joint lightning arrester. Scars on the brass disks indicate that other surges have been handled previously by the unit.

which may cause discomfort to personnel, ignition of flammable material, and in extreme cases, failure of the pipeline itself.

Potentials in the order of 100,000 volts may be induced momentarily by the above effects and may exist across an insulating flange. Potentials in the order of 50 volts are not unusual. With these values involved, it is obvious that location of an effective insulating joint must be given adequate engineering consideration. Otherwise possible employe injury and property damage is risked.

These, then, are not matters which are theoretical considerations; they are of practical importance in the operation of a safety-conscious company.

Power-line induction . . . It must be recognized that abnormal conditions occur on electrical transmission lines which cause extreme voltage surges. These voltage surges are tremendously in excess of normal operating voltages and their effect will be directly reflected in a parallel or an adjoining pipeline. The effects can, and do, travel for long distances on well-coated pipelines and cause arcing at insulating joints as well as an increased potential between pipeline and earth.

It is important to understand that insulating joints are not the cause of such phenomena but merely the point at which the effect appears in dramatic fashion.

Considerable research has been done under the auspices of the American Institute of Electrical Engineers and the Edison Electric Institute regarding the induced voltages in communication systems which parallel power systems. This research indicates that the following factors are involved in the induced voltage effect:

1. Physical distance between structures.

2. Amount of current in the power circuit.

3. Linear distance of parallel circuit involved.

4. Combined impedance of the systems in question.

An empirical formula developed by the research group may be applied to induced voltages on pipelines, though it is primarily aimed at communication-power systems studies. The formula is as follows:

$$V_x = 0.286\ (f/60)\ I_o + j0.2794\ (f/60)$$

$$\times\ [I_a \log_{10} (D_{cx}/D_{ax}) + I_b \log_{10} (D_{cx}/D_{bx}) + I_c \log_{10} (D_{cx}/D_{cx})]$$

Where:

V_x = voltage induced per mile of parallel
I_a, I_b, and I_c = 60-cycle currents (R. M. S.) in conductors a, b, and c
D_{ax}, D_{bx}, and D_{cx} = distance in feet from conductors a, b, and c to conductor x
I_o = zero sequence current R. M. S. per phase
f = cycles per second

Utilizing this formula and substituting average values that could be experienced, it will be determined that values in the magnitude of 15 to 20 volts per mile would be induced in a closely adjoining pipeline which had a high-quality protective coating.

Past occurrences . . . Actual situations of record that have occurred as a result of high-voltage effects are as follows:

1. A power fault on a buried cable adjoining a gas pipeline ruptured the power cable and established an arc to the pipeline, burning through the pipe and igniting the gas.

2. Interruption of extremely high voltages at an insulating flange in a producing well house caused an arc which ignited explosive vapors and caused destruction of the house.

3. High-voltage effect, probably lightning, ignited gas at an insulated regulator station.

4. Lightning caused failure of insu-

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lators on a power system closely adjoining a pipeline. The heavy fault currents followed a guy wire to an anchor near the line. An arc from the anchor burned a hole in the pipe. The current then followed the pipe for approximately 2,000 ft. to an insulating joint, left the insulated section and, in doing so, burned five holes in the pipe near the insulated joint. Escaping gas from the holes was ignited by the arc.

5. High-voltage arcing occurred at insulating joints in a valve and regulator pit and ignited the explosive atmosphere resulting in explosion and fire.

6. There have been many occasions when operating personnel have suffered electrical shock while working on pipeline fixtures or even on a pipeline itself. None of these have been severe but have caused discomfort and concern to personnel.

Figs. 1 through 4 are pictorial evidence of the effects of high-voltage surges. Note that in Fig. 1, the steel washer and insulating washer were severely burned and that the insulating spool was burned on the end and in the middle. While this burning was severe, the ⅛-in. thick material prevented complete failure.

A closeup of the steel washer is shown in Fig. 2. The loss of material is too great to have been caused by lightning alone; commercial fault currents would have to be involved.

High-voltage puncture of thin dielectric material is illustrated by Fig. 3.

Shunt installation . . . High-voltage shunts are available which can be used to bypass these surges to ground. One type uses thyrite which has a negative resistance-voltage characteristic. A properly designed unit for this service will offer a low-resistance path to ground for surge currents of high voltage. And, when the high-voltage currents have been safely handled, it will be able to block the normal voltages encountered in cathodic protection.

A thyrite unit which has been penetrated by high-voltage currents is shown in Fig. 4. Scars on the brass disks indicate that other surges had been handled previously by the unit. Our experience with high-voltage shunts has been limited to this type unit, and in every case they have eliminated insulating-joint failure.

From the above data and pictorial evidence, it should be apparent that high-voltage effects can, and do, exist on buried structures. Their values can be of sufficient magnitude to cause hazard to personnel and/or ignition of flammable atmospheres. Thus, engineering factors dictate that any insulating joint which has been installed in an area which might be classed as hazardous because of the possibility of explosive-vapor accumulation should be rendered ineffective—either by bonding or by removal of insulating material.

To maintain corrosion control, the joint should then be relocated in a nonhazardous area and be equipped with a high-voltage shunt if required. Installation of a shunt in a hazardous location is not the proper answer since arcing can occur at such devices.

Conclusion

Insulating joints are necessary fixtures for economic corrosion control, and the design of such joints must be based on operating conditions which will be encountered. Normal operating voltages are of minor consideration, but the high voltages which might occur are very important. There is little that can be done regarding initiation of such voltages so their effects must be adequately handled. Properly designed, high-capacity shunts at insulating joints are able to perform this function but it is important that neither an insulating joint nor a joint with a shunt be installed in an explosive atmosphere.

Finally, engineering data regarding high-voltage effects on buried structures is meager, and further research on the problem is indicated.

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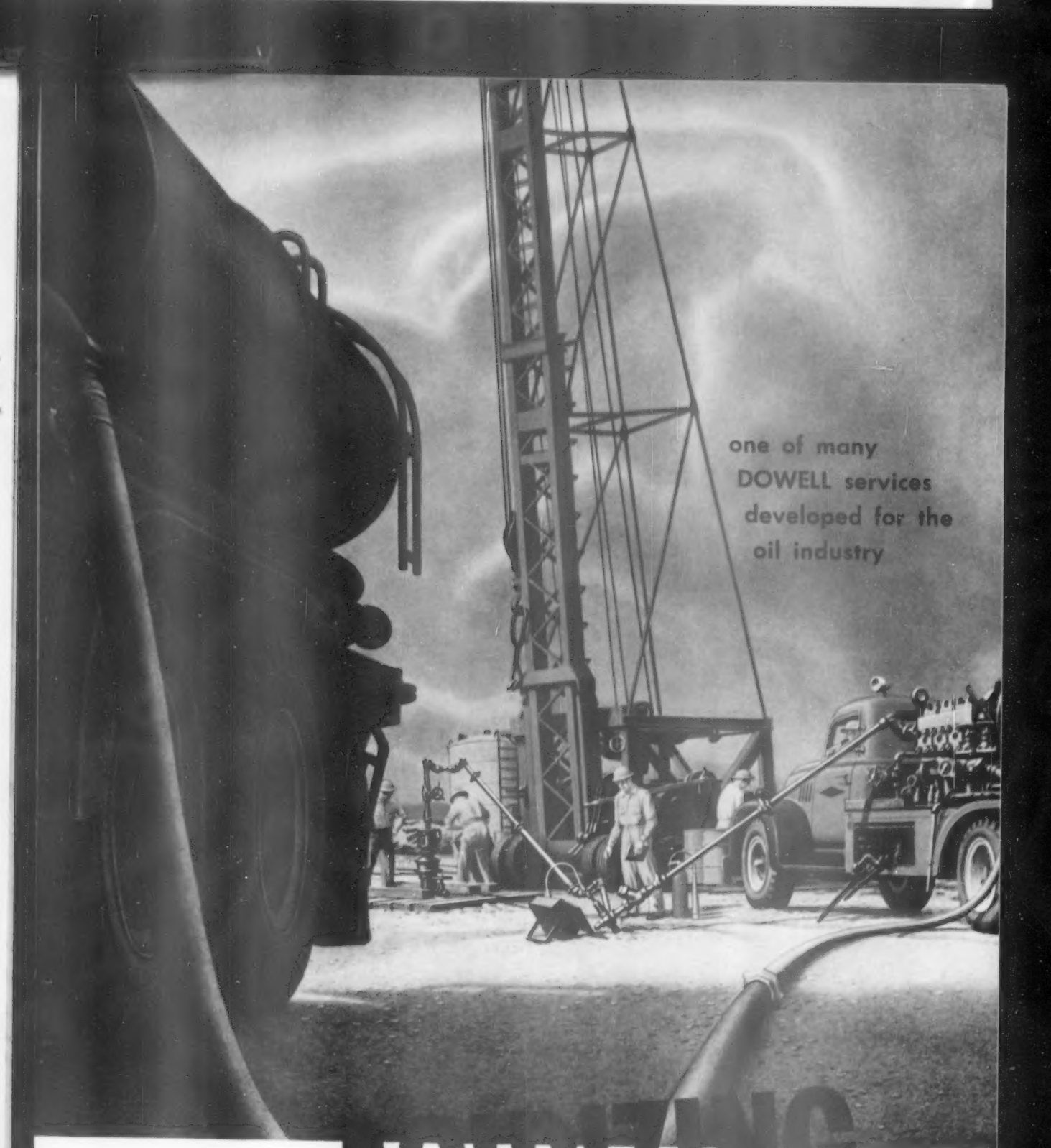

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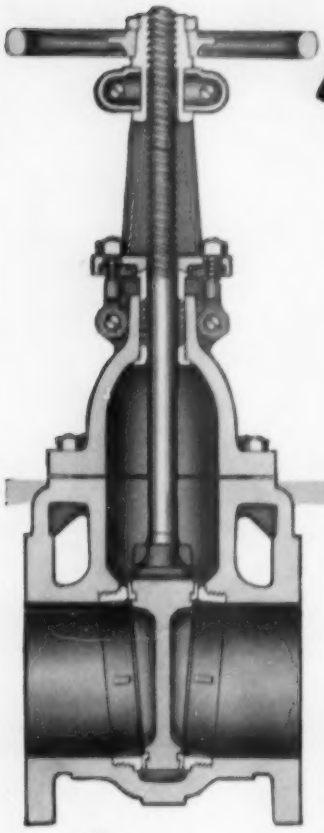

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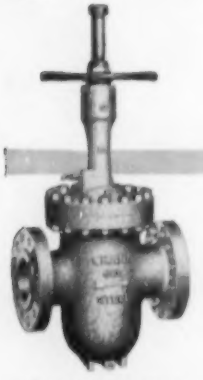
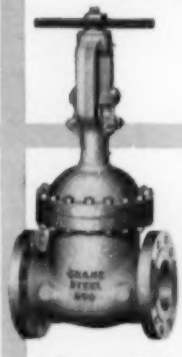
CRANE IRON BODY WEDGE GATES

Top-quality 125-pound gate valve with better all-round adaptability for many services. There's greater strength in the oval-shaped body and bonnet with extra metal where it's needed most. Flanged patterns have tie-ribs between body and bonnet flanges. Crane design also includes a solid web-type disc with long guides . . . a stem of liberal diameter with long thread engagement . . . a deep stuffing box with high-grade packing . . . a two-piece ball-type gland and flange—plus an easy-to-grip handwheel with oval-shaped rim. OS&Y and non-rising stem patterns, brass trimmed or all-iron. Screwed, flanged and hub end valves available. Sizes up to 48 inch.



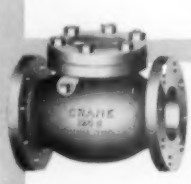
CRANE CLASS 600 GATES

Even infrequent operation won't affect their efficiency, for all working parts are sealed in grease. Dual-seating double disc is fully seated in open as well as closed position, thereby solving erosion problems. Conduit-type disc ports coincide exactly with seat openings for smooth, unobstructed flow with minimum pressure drop. Full-way or Venturi patterns for working pressures up to 1440 pounds, oil or gas. Sizes 2 to 30 inch; flanged or welding ends.



CRANE STEEL 300-, 400-, 600-POUND WEDGE GATES

Famous throughout the industry for their lasting service. The steel valve with the superior *Exelloy* trim that resists corrosion, erosion and wear. You'll like the smooth operation, the tight seating—the minimum maintenance. Available in a wide range of sizes with flanged or welding ends.



CRANE IRON BODY SWING CHECKS

Well-proportioned, sturdy valves, globular shaped to provide ample flow. *Disc cannot stick in open position.* All-iron valves have integral seating surfaces. Brass-trimmed valves have screwed-in body seat ring. All sizes have hinge suspended in the body. Easily adapted for outside lever and weight. Sizes up to 24 inch.

THE BETTER QUALITY... BIGGER VALUE LINE... IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

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To The Oil and Gas Journal: Please send me further information, without obligation, on items of New Equipment or Bulletins I have checked (✓) from your issue of December 20, 1954

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The cards shown here are supplied for your convenience. Just ✓ ✓ ✓ check the circle with the number of the item in which you are interested, tear off the card, and drop it in the mail.

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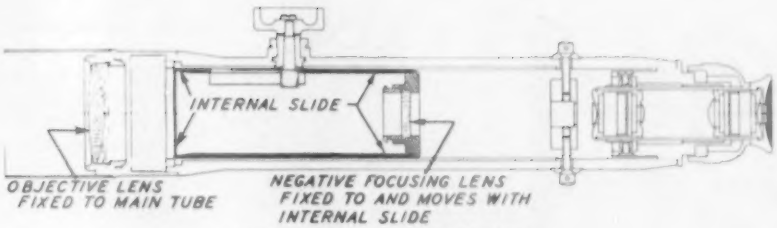
. . . What's New in Equipment?

Use the handy Time-Saver Cards ✔✔✔ to obtain additional information on these items

by Dan B. Miller



INTERNAL FOCUSING

Transits Feature Internal Focus

All models of Gurley transits and alidades now include the features of internal focusing, which is in combination with the variable power eyepiece and makes possible a greater range of magnification than was possible with external focusing-type instruments.

Alidades will have a much larger objective lens than before, and will allow more light in the instrument. The Gurley telescopic solar transit will be available with either internal or external focus. Chief advantages of internal focusing are the fact that the objective lens is statitonary, and the telescope is thus protected from dust. Another is that the instrument man can eliminate figuring focal length plus constant, since stadia distance can be figured from the center of the instrument, instead of in front of the old-style objective lens. *W. & L. E. Gurley.*

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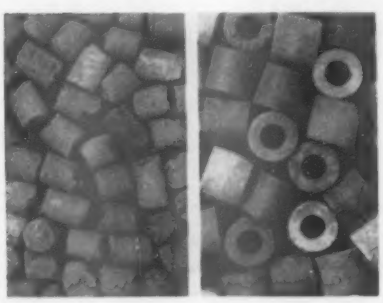

Higher Ammonia Synthesis Attained with New Catalyst

In recent commercial tests, G-29 catalyst, available in extrusions or rings, has demonstrated significant economic advantages over similar nickel-base catalysts. In preparing ammonia-synthesis gas from natural gas by the steam-reforming process, it was found that a 25 per cent increase in production capacity could be obtained without sacrificing the quality of the synthesis gas. At the production rates used with previously available catalysts, it is possible to reduce the reaction temperature by 100° F. without loss of efficiency, thus saving process fuel costs.

The G-29 catalyst contains approximately 27 per cent nickel that becomes active in the reforming of hydrocarbons at temperatures of 1,100° to 1,850° F. It is employed in the production of ammonia synthesis gases, controlled atmospheres and carrier and fuel gas, and for the dissociation of ammonia.

The catalyst is preshrunk so that physical shrinkage at temperatures below 1,850° F. will be less than 5 per cent. The catalyst is generally supplied in the form of ½ to ¾-in. extrusions having apparent gross densities of 84 and 80 lb. per cu. ft. respectively, and may also be supplied in the form of ¾-in. rings. *Girdler Co.*

Check No. 2 On The Time-Saver Card

New 65-Ton Blocks Simplify Tubing Work

A new line of 65-ton tubing blocks is designated as Type D. Short and compact, these tubing blocks fall fast and won't foul up. Sheave bearings are heavy-duty cylindrical roller bearings, and hook bearings are heavy-duty tapered roller thrust bearings. These blocks are available with double or triple 24-in. sheaves grooved for ¾, ⅞, or 1-in. line and may be obtained with spring hook, spring duplex hook, or spring triplex hook. The hook swivels freely or locks in any one of eight positions and is especially engineered for space saving and safety. With a factor of safety three to one on yield point, all blocks are well within A.P.I. specifications. *Guiberson Corp.*

Check No. 3 On The Time-Saver Card

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Instrument Designed for Surface Temperature Checks

A new surface-temperature thermometer is for temperatures up to 750° F. The instrument is designed for the fast and accurate checking of the surface temperatures of surfaces where the temperature has a range from 50° to 750° F. The heat sensitive element in this hi-heat thermometer consists of a bimetal spiral which has been aged and accurately calibrated for maximum

stability. The metals comprising the spiral have been specially designed for high temperatures to over 750° F.

The spiral is closely coupled to the heated surface to be measured and the thermometer is affixed to the surface by means of two Alnico magnets. The two magnets are incorporated within the thermometer base and the bimetal receptacle itself becomes an integral part of the magnetic circuit, thereby assuring an intimate and powerful contact. Total weight is less than 2 oz. *The Pacific Transducer Corp.*

Check No. 4 On The Time-Saver Card

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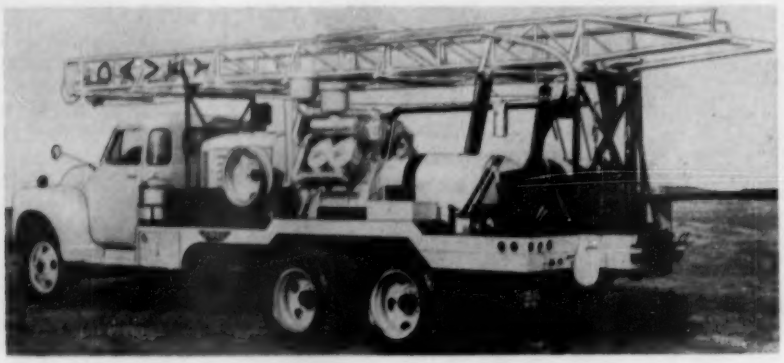


Improved Drill Uses Air or Water

A new and improved model of the M-8A heavy-duty rotary drill is designed for mounting on any standard truck, and utilizes both compressed air and high-pressure water for drilling. It has a rated capacity of 6¼-in. holes up to 300 ft. with air and 1,000 ft. with mud.

Compressor for air-blast drilling is a Davey 500-cu. ft. per minute unit. The high-pressure water pump is of heavy-duty duplex type. Compressor and pump are driven by a GMC-471 engine mounted on the truck bed. This employs a five-speed transmission for different drilling rates. The new Model M-8A is recommended for water-well drilling, core drilling, structure testing, and, shot and blast holes. Its 30-ft. mast has a fabricated steel crown-block assembly with two 20-in. roller-bearing sheaves. Unit is designed for pulling 15-ft. drill-section stems. Weight of the complete unit, as illustrated, is approximately 20,000 lb. *Davey Compressor Co.*

Check No. 5 On The Time-Saver Card

●

Salamander Brings Heat To Outdoor Work Areas

Efficient, economical heating of outdoor and semienclosed areas is possible with a portable, oil-fired, high-velocity, hot-air heater. The new Clayton Salamander, with an hourly output of 300,000 B.t.u.'s was developed to overcome the handicap of cold, damp, or foggy weather in maintaining production on outside operations.

Available with either electric drive for plug-in to any 110-volt, 60-cycle outlet, or with a completely self-contained gasoline engine which allows operation independent of utility connections, the Salamander provides quick, abundant heat for storage yards, loading platforms, docks, open sheds, or open and semienclosed storage spaces. Used to preheat trucks and other powered equipment in cold weather, the Salamander cuts down the starting time to get vehicles rolling.

Standard specifications for both the electric-drive and gasoline-engine-drive models are a thermal capacity of 300,000 B.t.u.'s per hour, with a heated air output of 2,400 cu. ft. per minute, delivered at high velocity, and a ventilating air-temperature rise of 150° F. The hot air discharge outlet is 14 in. in diameter and is supplied with an adjustable deflector. Optional equipment includes a flexible canvas air duct for directing the flow of heated air to selected areas. Fuel consumption is 2.15 gal. per hour utilizing economical No. 1 or No. 2 fuel oil or kerosine. The fuel tank has a capacity of 18 gal., thus allowing 7 to 8 hours of continuous operation without refilling. A highly efficient fuel pump of the diaphragm type, designed so that it is not subject to damage by running dry, and to operate unaffected by moisture or foreign matter, is standard equipment for both models. *Clayton Manufacturing Co.*

Check No. 6 On The Time-Saver Card

●

Packaged Pilot Plants Range From 5 To 60 Gal.

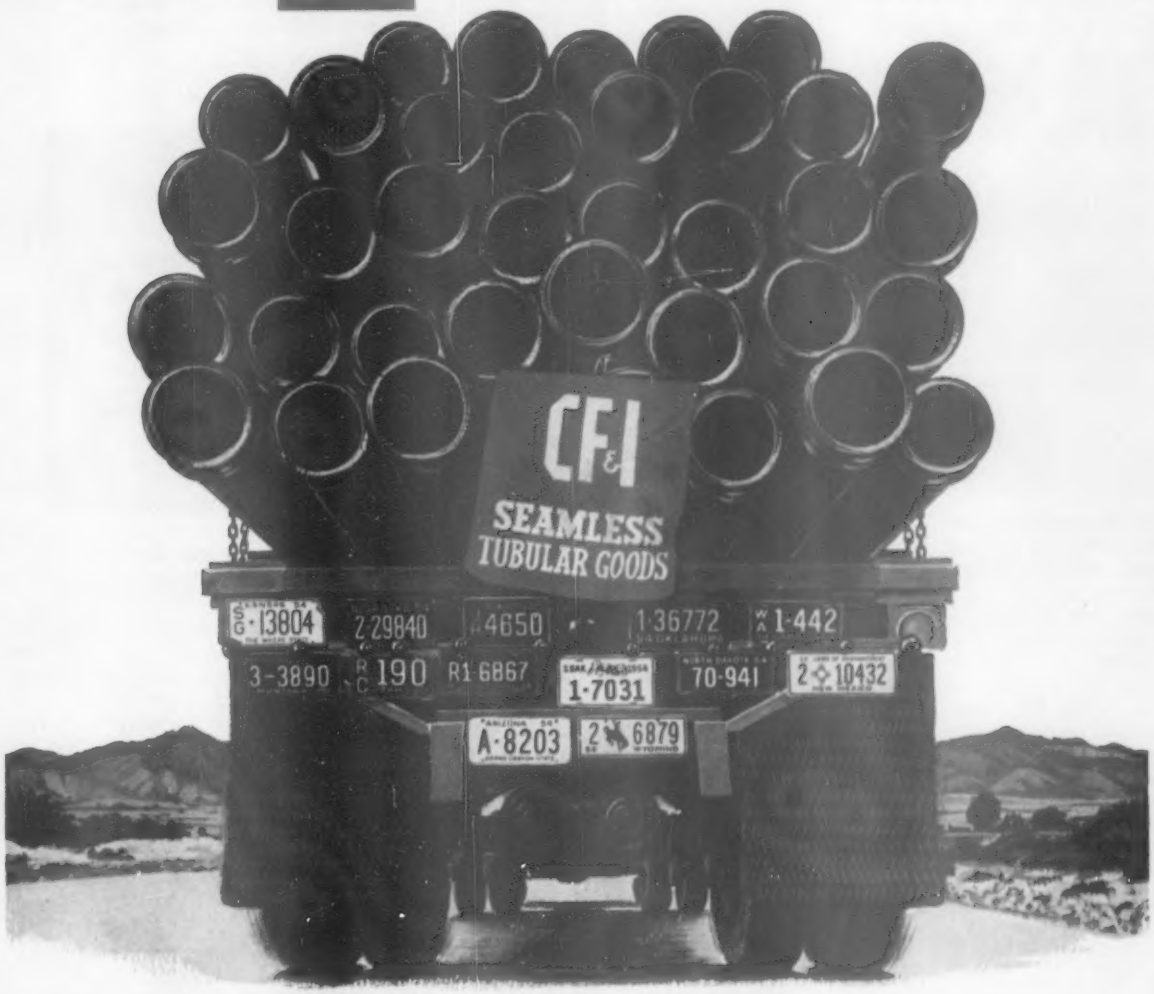
A new line of reaction-distillation pilot plants ranges from 5 to 60-gal. capacities. Units consist of reactor,

condenser, receiver, decanter, piping, valves, and instruments, all in one packaged unit.

In addition, small reactors, designed for flexibility and convenience in pilot work, are offered. All units have been field-tested. Many of industry's pilot-plant requirements can be supplied from standard equipment and most other needs can be met by relatively minor modifications of standard models. In addition to cost savings and correct design features, the off-the-shelf pilot-plant designs also are time savers to research and development engineers. *The Patterson-Kelly Co., Inc.*

Check No. 7 On The Time-Saver Card

from the new CF&I SEAMLESS TUBE MILL



headin' for the oil country

Prompt and efficient service for the oil and gas industries of the Rocky Mountain and Southwest areas. That's the need that brought into being the new CF&I Seamless Tube Mill at Pueblo, Colorado—newest mill of its type located West of the Mississippi.

Here—centrally located to some of the largest oil and gas producing regions—the most modern facilities and machinery combine with step-by-step quality control to assure seamless casing and tubing that for precision and quality are unrivaled in the industry.

CF&I Seamless Oil Country Casing and Tubing meet API STD 5A specification—in sizes from 2⅜" O.D. through 9⅝" O.D.

CF&I TUBULAR PRODUCTS

THE COLORADO FUEL AND IRON CORPORATION CFI

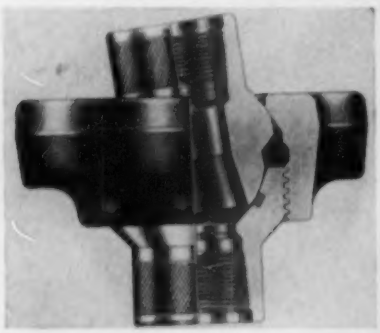
DENVER, COLORADO

2519

What's New... Use the handy Time-Saver Cards

Union Tolerates Total Of 15° of Misalignment

The Weco Figure 603 misaligning union, tested to 6,000 psi., has a total misalignment of 15° F. The male sub is belled out to provide smooth flow



in maximum misalignment. It does not project into the flowway in any misaligned position. It has the ball-and-cone seat to assure a perfect sealing contact. An O-ring in the sub protects the seat against corrosion and abrasion, but is not essential to sealing. A ball shoulder on the male sub, contacting the angle on the wing nut, provides maximum strength and support at any degree of misalignment. Figure 603 union is made in 2, 3, and 4-in. sizes and, in addition to threaded sub ends, is available with ends bored for welding. *Well Equipment Manufacturing Corp.*

Check No. 8 On The Time-Saver Card

●

Plastic Valves, Fittings Suitable for 125 Psi.

Luncor PVC valves and fittings resist most chemicals used in industry. The molding process gives the PVC material exceptional strength, protects its natural corrosion resistance, and substantially reduces manufacturing costs.

Base material used is polyvinyl chloride which is now available in the form of corrosion-resistant piping. It is molded in rigid form, suitable for pressures up to 125 lb. and 150° F. The valve is presently available in a Y-type globe design. A complete line of plastic fittings made of the same material is also available. These include caps, couplings, plugs, unions, reducing bushings, flanges, 45 and 90° elbows, and tees. *Lunkenheimer Co.*

Check No. 9 On The Time-Saver Card

●

Bottom-Hole Pump Designed For Stripper Well Needs

The design of the Pleuger bottom-hole pump consists of one 5½-in.-diameter assembly, 3½ ft. long which couples a diaphragm plunger with an oil-filled elongated motor through a gear. The complete pump has a weight of about 180 lb.

Fluid is conveyed into the inner pump by two suction valves and is brought up through the tubing. The 2 to 4 hp. motor is supplied with electric power through a cable which is fixed to the outside of the tubing. The motor can be wound for a frequency of 50 to 60 cycles, voltage as required.

The pumps tested in German oil fields operate against a maximum head of 1,500 to 1,800 ft. at a capacity of 30 to 55 bbl. per day. An additional model can lift against a head of 3,600 ft. at 20 to 30 bbl. per day.

Advantages of this pump are its lightweight, easy installation, and continuous operation. The capacity of the pump is automatically adjusted according to the supply from the formation.

A simple oil-surface measuring device records within 1 per cent on scale the height of the oil over the pump, thereby informing the operator of changes in fluid level. *Hugo Stinnes Zweigniederlassung, Brennstoff- und Schiffahrts-Gesellschaft.*

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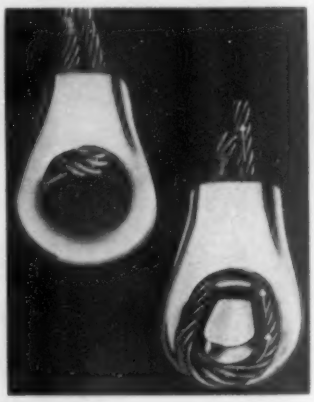

New Wire-Rope Socket Eliminates Eye Splicing

A new wire-rope fitting called the wedge-type choker socket has been designed to provide a quick, inexpensive method of putting an eye in a piece of wire rope. It can be installed in the field without any special equipment or tools in 3 minutes.

Industry, long familiar with wedge-type sockets, will be quick to recognize the advantages of this wire-rope ending. To install, it is necessary to thread the rope up through the socket, loop it around and thread it back in the socket, place the wedge in the loop formed, and pull tight. It can be quickly disengaged by driving out the wedge.

Cast of work-hardening, manganese steel, the socket provides a long wearing eye that will not pull shut. The wedge-type choker socket and wedge in the ½ and ⅝-in. sizes weighs 3¾ lb. *Electric Steel Foundry Co.*

Check No. 11 On The Time-Saver Card

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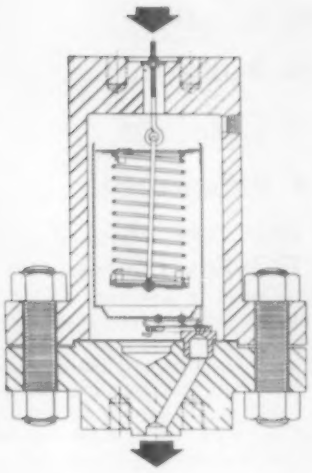
Trap Features Spring-Balanced Open Float

A new forged steel trap for draining water from compressed air or gas systems at pressure to 3,000 psig. where no gas loss is permissible, features a non-collapsible, spring-balanced open float which normally holds the valve closed by the weight of water in the bucket compressing the spring. The entering condensate fills trap body adding buoyancy to the float. The buoyancy plus the spring compression then overcomes



the weight of the water and bucket. The bucket floats opening the valve and allowing the condensate to discharge. Water-sealed valve closes before all the water is discharged. Capacity at 2,000 psig. is 2,000 lb. per hour. Working parts are stainless steel. Body and cap are ASTM F-5 chrome moly steel. Inlet connections are flanged. Outlet connections are flanged or screwed. Diameter at flanges is 2½ in. *Armstrong Machine Works.*

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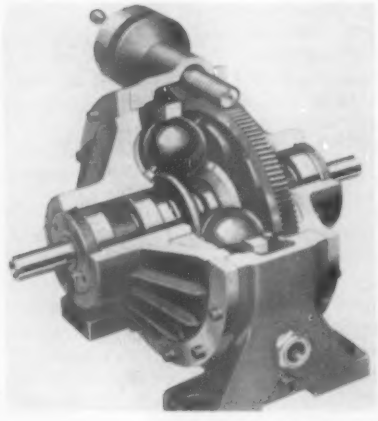

Speed Variator Offers Stepless Output Range

The Speed Variator is now available in nine sizes, ranging from ½ to 10 hp. at 1,750 input r.p.m. Power is transmitted from the input shaft to the output shaft through alloy-steel driving balls which are in pressure contact with disks attached to the two shafts.

Relative speeds of the two shafts are adjusted through a nine to one range (one third to three times the input speed) by changing the angular positioning of the axles on which the balls rotate. The result of this simple arrangement is an infinitely variable and stepless range of output speeds from one constant speed-power source.

Operating efficiencies of 75 to 90 per cent are easily maintained over a wide range of operating conditions. Coaxial input and output shafts rotate in the same direction, either clockwise or counterclockwise. The simplicity of construction makes possible accurate speed regulation without complicated linkage and without drift. Speed is regulated by a simple manual adjustment with indicator, or by manual or power-operated remote-control devices. There is ample bearing support for both input and output shafts to carry overhung pulleys. *Cleveland Worm & Gear Co.*

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New Issue — *December 8, 1954*

$125,000,000

Tennessee Gas Transmission Company

First Mortgage Pipe Line Bonds, 3½% Series due 1975

Dated December 1, 1954 — Due February 1, 1975

Price 101.44%

and interest accrued from December 1, 1954 to date of delivery

Copies of the Prospectus may be obtained from any of the undersigned who are qualified to act as dealers in the respective States.

Stone & Webster Securities Corporation — White, Weld & Co. — Halsey, Stuart & Co. Inc.

Blyth & Co., Inc. — Eastman, Dillon & Co. — The First Boston Corporation

Glore, Forgan & Co. — Goldman, Sachs & Co. — Harriman Ripley & Co. Incorporated

Kidder, Peabody & Co. — Lehman Brothers — Merrill Lynch, Pierce, Fenner & Beane

Paine, Webber, Jackson & Curtis — Salomon Bros. & Hutzler — Smith, Barney & Co.

Union Securities Corporation — A. C. Allyn and Company Incorporated

American Securities Corporation — Bear, Stearns & Co. — A. G. Becker & Co. Incorporated

Blair & Co. Incorporated — Central Republic Company (Incorporated) — Clark, Dodge & Co. — Coffin & Burr Incorporated

Dick & Merle-Smith — Drexel & Co. — Equitable Securities Corporation

Hallgarten & Co. — Hemphill, Noyes & Co. — Hornblower & Weeks

W. E. Hutton & Co. — Ladenburg, Thalmann & Co. — W. C. Langley & Co.

Lee Higginson Corporation — F. S. Moseley & Co. — R. W. Pressprich & Co.

L. F. Rothschild & Co. — Wertheim & Co. — Dean Witter & Co.

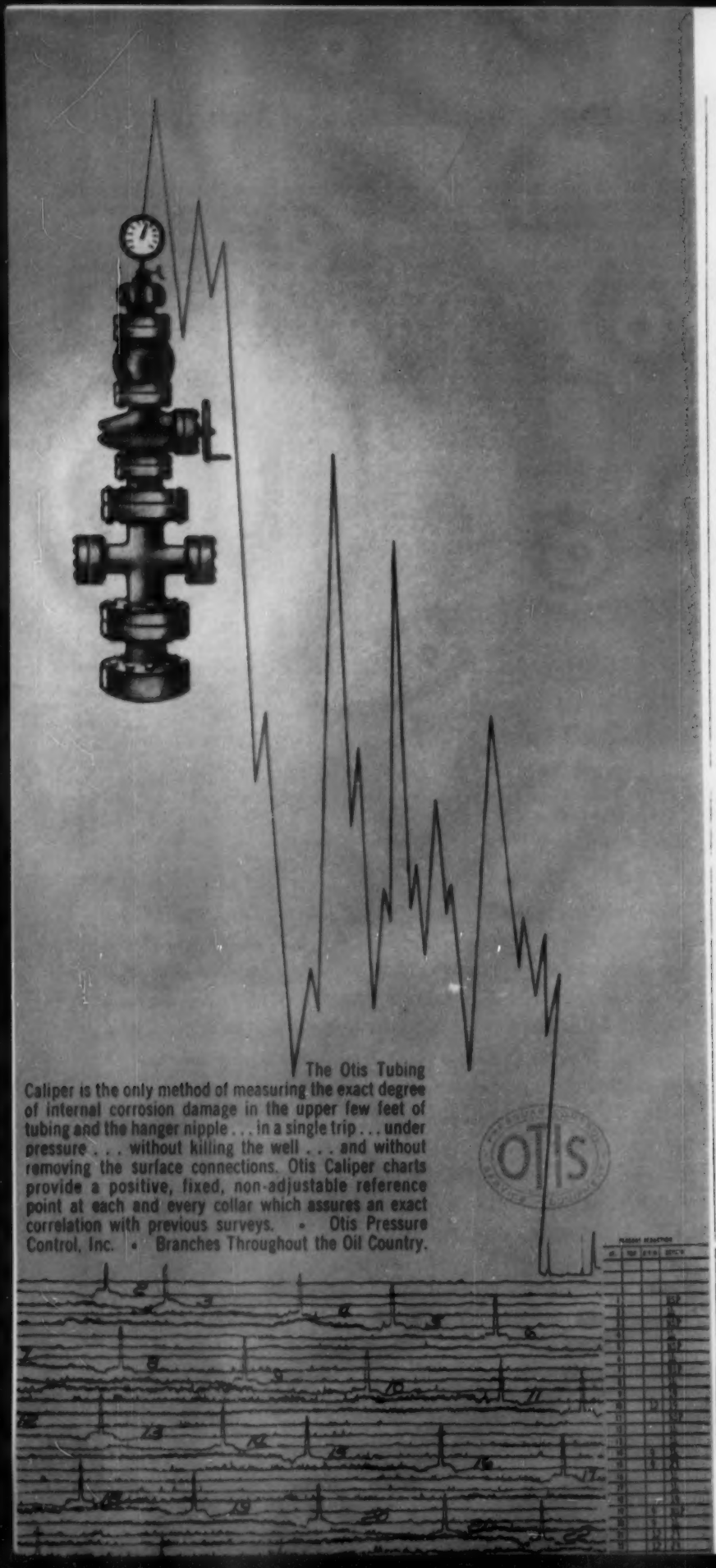
Alex. Brown & Sons — Dominick & Dominick — Estabrook & Co.

Hayden, Stone & Co. — Carl M. Loeb, Rhoades & Co. — Laurence M. Marks & Co.

Reynolds & Co. — Riter & Co. — Schoellkopf, Hutton & Pomeroy, Inc.

Stroud & Company Incorporated — Spencer Trask & Co. — Tucker, Anthony & Co.

G. H. Walker & Co. — Weeden & Co. Incorporated



The Otis Tubing Caliper is the only method of measuring the exact degree of internal corrosion damage in the upper few feet of tubing and the hanger nipple . . . in a single trip . . . under pressure . . . without killing the well . . . and without removing the surface connections. Otis Caliper charts provide a positive, fixed, non-adjustable reference point at each and every collar which assures an exact correlation with previous surveys. • Otis Pressure Control, Inc. • Branches Throughout the Oil Country.

They're NEW

- Bulletins
- Catalogs
- Brochures

for your copy, check ✓ ✓ the Time-Saver Cards.

Mudwonder Catalog. Alloy-steel valves, designed primarily for mudline service in the oil-drilling industry but also suitable for other abrasive fluid applications, are described in new catalog section 12-S. Now enlarged to contain more complete design and material details, this new, six-page section emphasizes the valves simplicity of design. Valve sizes, materials, part numbers, and dimensions for the line are included for 2, 3, and 4-in. valves rated at 2,000 psi. w.p. (4,000 psi. test) and 3,000 psi. w.p. (6,000 psi. test) with either screwed or flanged ends. *Edward Valves, Inc.*

Check No. 14 On The Time-Saver Card

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Twin Disc Fluid Couplings. New bulletin No. 144-D, gives installation and performance data on fluid couplings. Complete with diagrams and drawings, the new bulletin graphically shows the ease of applying Twin Disc fluid couplings on any type industrial equipment, powered by any type electric motor or internal combustion engine from ¾ to 850 hp. In addition, the complete fluid-coupling line is shown, with standard models providing standard input - output combinations, and standard models in packaged units. *Twin Disc Clutch Co.*

Check No. 15 On The Time-Saver Card

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EB Weld Insert. A 10-page bulletin describes a new welding technique known as the EB weld-insert process. This process permits deposition of a root pass which produces a smooth and uniform weld surface even though the actual welding is done on one side only. The process and the insert used with the process are especially suitable for the butt welding of stainless and alloy-steel pipe, both seamless and welded. *Arcos Corp.*

Check No. 16 On The Time-Saver Card

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Superpressure Apparatus. The latest developments in high-pressure equipment for pressures to 100,000 psi. and temperatures to 1,000° F. are presented

in Catalog 406. The high-pressure equipment described embraces pilot plants, reaction vessels, valves, fittings, tubing, pumps, compressors, pressure balances, instruments, and accessories. Numerous new-design and operating features for high-pressure research and commercial engineers are presented. *American Instrument Co.*

Check No. 17 On The Time-Saver Card

●

A New Fabrication Manual For Clad Steels gives full coverage to the manufacture of clad steels and the physical and chemical properties of each one. In addition, the 72-page illustrated manual contains detailed sections on flame cutting, forming, welding, and finishing. Tabulated data include types, plate sizes, weights, shearing tolerances, and other specifications for the entire line of clad materials. *Lukens Steel Co.*

Check No. 18 On The Time-Saver Card

●

Norelco Portaflux—New Portable Magnetic Particle Test Unit describes the latest and most economical method for checking ferrous metal objects for surface discontinuities. The literature explains how the method is used in industries which depend on high-quality metal products. Illustrated with many photos, drawings, and diagrams, the new booklet gives a complete description of the basic principle on which magnetic particle testing is based. It also tells about various inspection procedures and describes in detail how the Portaflux is operated. *North American Philips Co., Inc.*

Check No. 19 On The Time-Saver Card

●

Guide to the Selection of Engineering Irons. Bulletin A-69, a 28-page basic reference bulletin is compiled primarily for design engineers. It presents the valuable characteristics of modern nickel-cast irons and illustrates their broad acceptance throughout industry. Fifty illustrations indicate wide industrial usage in all sizes and shapes. Twenty-seven useful tables, charts, and photomicrographs show how, through the use of nickel, alone or in combination with other alloying elements, the engineering properties of cast iron can be controlled to meet service requirements. *International Nickel Co.*

Check No. 20 On The Time-Saver Card

●

Recent Advances in Engine and Compressor Design. A comprehensive and illustrated article by C. A. Chamberlain, design engineer with Clark Bros Co., discusses the newest two-cycle development, turbocharging. The article explains how higher power output has been achieved with lower fuel consumption and lessened cooling requirements. *Clark Bros. Co.*

Check No. 21 On The Time-Saver Card

●

Armored Motors. A new, full-color, four-page publication describes armored motors (d.c. types MD and MDP, 600 series). Designated GEA-4654C, the bulletin provides information on performance and maintenance features of the heavy-duty G-E motors. Included in the bulletin are horsepower ratings and mechanical data. Diagrams and photographs illustrate various applications of the armored motors in the oil and construction industries. *General Electric Co.*

Check No. 22 On The Time-Saver Card

●

Aloyco 20 Alloy. A new, eight-page bulletin describes Aloyco 20 corrosion-resistant valves. The new bulletin No. 8 incorporates recent field-test data on Aloyco 20 in various concentrations of sulfuric acid at different temperatures. It also includes a description, applica-

Minimum Blow Down

Inferno 2" Safety Pop Valves are set and sealed at the factory with the minimum blow down permitted by the ASME Code. This assures smallest possible loss of steam without sacrificing safety. Inferno Pop Valves are available in four different styles with steam pressures up to 350 lbs. and Oil-Water-Gas pressures to 1,000 lbs. Write for your copy of Bulletin No. 31.

THE INFERNO CO.
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SHREVEPORT, LA.
INFERNO

tions, and advantages of this austenitic alloy, together with engineering specifications and cross-sectional illustrations of 39 Aloyco 20 valves and fittings. *Alloy Steel Products Co., Inc.*

Check No. 23 On The Time-Saver Card

●

Reliable Lease-Pump Power is the title of a new booklet depicting the use of Caterpillar diesel engines and electric sets used in lease pumping. Booklet D479 stresses dependability and economy of operation whether Cat diesel engines are used for prime movers, secondary recovery, or for single or multiple electrified or mechanical pumping units. Photographs of actual pumping sites are contained in the booklet showing engines to be all-weather, round-the-clock performers. The back cover of the book places emphasis on the swift Cat dealer parts-service facilities. *Caterpillar Tractor Co.*

Check No. 24 On The Time-Saver Card

●

SK Fig. 320 Continuous Pipeline Water Heater, designed for direct connection to water or steam lines, will produce a water temperature rise up to 100° F. with water at 100 psig. and steam at 100 psig. In the heater, liquid under pressure attains a high velocity passing through a nozzle. Steam enters through a series of slanting nozzles in the combining tube and an intimate mixing of liquid and steam occurs in the venturi throat, where the liquid absorbs all of the heat of the steam. The hot liquid is then discharged into a tank or through a piping system. Extensive data on this equipment is published in Bulletin 3-A. *Schutte & Koerting Co.*

Check No. 25 On The Time-Saver Card

●

pH Control of Cooling-Tower Water, a new four-page process data sheet, offers suggestions on measurement and control of pH of cooling-tower water, and describes equipment for this application. The sheet includes conservation of makeup water, wood protection, prevention of scale, and minimization of slime among the benefits of pH control of tower water. *Leeds & Northrup Co.*

Check No. 26 On The Time-Saver Card

●

Chart to Determine Savings and Size of Continuous Blowdown System. A simplified chart to rapidly calculate the savings possible through heat recovery with a properly sized automatic continuous blowdown system has been developed. Incident to the savings determination is the rate of boiler blowdown for the water conditions and the selection of a correctly sized heat exchanger. The chart is based on total dissolved solids in the boiler water and the permissible concentrations to determine total blowdown. When blowdown quantities are known, selection of heat exchanger and savings can be determined with a single chart. *Henszey Co.*

Check No. 27 On The Time-Saver Card

●

Corrosion Control. How to control corrosion with stainless tubing and pipe is the subject of a new 28-page catalog. The booklet, fully illustrated with photographs of parts and applications, contains corrosion-resistance tables, charts, field reports from users, detailed test results, and similar engineering information. While covering many types of stainless alloys, the catalog also describes the characteristics and performance of several supercorrosion-resistant steels. All the main types of corrosion are described, along with a breakdown of the basic types of applications for stainless tubing and pipe in anticorrosion service. *Carpenter Steel Co.*

Check No. 28 On The Time-Saver Card

Telephones:
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Ratigan

No. 176-1B Lubricating Cap

Working together, the Ratigan Lubricating Cap and the Ratigan Stuffing Box make an efficient combination providing the polished rod with continuous lubrication . . . the lubricating cap when the flow of oil in the tubing is retarded, and the self-oiling stuffing box when the well is not heading. The lubricating cap provides longer wear of the packing rubbers and more economical operation of the stuffing box.

SOLD THROUGH LEADING SUPPLY STORES

J. P. RATIGAN, Inc.
1213 Santa Fe Ave., Los Angeles 21
Export: National Supply Co. Inc. Export Dept.
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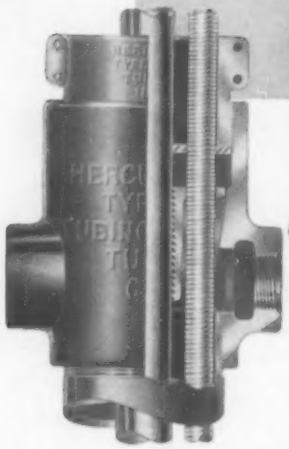
IN MEDIUM DEPTH WELLS

HERCULES "TYPE J-5-R" AND "RC" TUBING HEADS

DESIGNED FOR USE WITH REDA PUMPS



Designed for medium depth wells. Will suspend 5000 feet of 2" or 2½" Tubing or a proportionate amount of 3". Available in casing sizes from 5½" OD (which will suspend 2" or 2½" tubing only) to 7" OD which will suspend 2", 2½" or 3" tubing. Pressure cast steel body hydrostatically tested to over 4000 psi. 2" LP outlets furnished. (3" optional). Approximate over-all height, 14½".

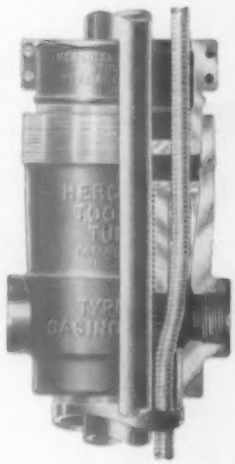
Both heads feature the positive aligning hinged slips (which allow the electric cable to pass through the slips close to the tubing) and the overhead packing arrangement which packs off the tubing and electric cable simultaneously. The packing arrangement in both heads is tested to 2000 psi.

"TYPE J-5-R" TUBING HEAD

SOLD AT ALL SUPPLY STORES

Built to support the weight of 10,000 feet of 2", 2½" or 3" Tubing, 5,000 feet of 4", or 4,500 feet of 5½" Casing. Available in casing sizes from 6⅝" to 9⅝" OD. 3" side outlets furnished. Pressure cast steel body tested to 4000 psi. Approximate over-all height, 23".

IN DEEP WELLS



"TYPE RC" TUBING HEAD

HERCULES TOOL COMPANY

SINCE 1924

Manufacturers of Oil Field Equipment

GENERAL OFFICES AND PLANT • TULSA, OKLAHOMA

Export Representative Oil Field Equipment Co., Inc. • 30 Church Street, New York, N. Y.

Merry Christmas KELCO *Happy New Year*

BEN F. KELLEY CO., INC.

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Earl Fuller, Indonesia
Paul Koester, Venezuela
Allan Pike

YOUR KELCO REPRESENTATIVES

EQUIPMENT MEN . . . in the News

Halliburton Shifts Babin And Short to Tulsa Office

Halliburton Oil Well Cementing Co. is expanding its Tulsa office, transferring Schley Babin, Jr. from Oklahoma City and Dick Short from Ardmore, Okla. The Tulsa office is headed by Walt Woods.

Babin, who is a sales engineer, will

S. BABIN

D. SHORT

assist Woods in customer-contact work. Being a 1949 geophysical-engineering graduate of the University of Tulsa, Babin has worked for Halliburton since college graduation.

Short, a 19-year veteran with Halliburton, will direct the company's Electrical Well Services' sales efforts for the eastern, northern Mid-Continent, and mountain regions.

Woody, Wallace Named To New Allis-Chalmers Posts

The appointment of G. V. Woody as special assistant to C. W. Schweers, vice president, director of sales, general machinery division, Allis-Chalmers Manufacturing Co., has been announced by J. L. Singleton, vice president in charge of the division.

William M. Wallace has been appointed to succeed Woody as manager of the processing machinery department.

Previously, Woody was manager of the firm's processing machinery department, a post he has held since 1945. Woody became associated with Allis-Chalmers in 1909. From 1912 to 1919 he was engineer in charge of the centrifugal pump department. After operating his own Allis-Chalmers agency for a short time, he was made manager of the division's Wilkes-Barre, Pa., office, a position he held from 1920 to 1926. After serving in several other capacities from 1926 to 1934, he was appointed manager of the division's Pittsburgh office.

Wallace has held several positions with Allis-Chalmers including assistant to the vice president of Allis-Chalmers' general machinery division. Prior to 1951 he served as a special assistant to Woody for 5 years. Wallace also represented Allis-Chalmers in its Denver and Pittsburgh district offices.

Frontier Makes Walker Field Sales Manager

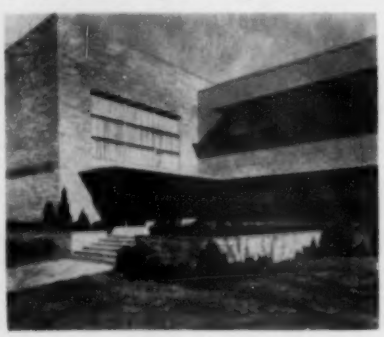
Jerry C. Walker has been promoted to the newly created position of field-sales manager, according to an announcement by Frontier Chemical Co. Walker formerly managed the company's petroleum sales and this move will bring him into all phases of company sales.

At the same time, Robert J. Redmond, formerly sales representative in the Texas area, has been made sales coordinator to handle liaison work between production, sales, and customers in regard to handling of orders in the home office.

These announcements were made by Melvin E. Clark, vice president, marketing, on the occasion of the company's annual sales meeting.

J. F. Pritchard Opens New Office Building

J. F. Pritchard & Co. recently opened this new, modern, general office structure at Kansas City. Incorporating approximately 46,000 sq. ft. of floor space, including basement, it contains executive offices, a large drafting room, a conference room, a library, and modern private offices. President J. F. Pritchard stated that the company was organized in Kansas City in 1920, and through the years has become a leading firm of engineers and constructors for the petroleum, gas, chemical, and power industries.



Cousland to Represent Orbit Valve Company

L. R. COUSLAND

Leon R. Cousland now represents Orbit Valve Co. in Kansas and Texas Panhandle according to R. G. Cole, general sales manager of Orbit. Cousland's headquarters will be at Liberal, Kans. This territory was formerly served by Claud W. Brown from Oklahoma City.

Prior to joining Orbit, Cousland had been with Bethlehem Supply Co. for 9 years and most recently was field representative in Colorado for that company.

Western Co. Names Cleary To Administrative Staff

J. D. CLEARY

Appointment of John D. Cleary to operations division's administrative assistant has been announced by Walter Beadle, operations vice president of Western Co., Midland, Tex.

Prior to joining Western's staff, Cleary served as chief industrial engineer with Armstrong Tire & Rubber Co. and Carborundum Co.'s New York plant. Immediately before assuming his new Western position, Cleary was chief industrial engineer with Modine Manufacturing Co.

With Western, Cleary will do considerable work in the field of operational methods and procedures.

Dowell Acquires Control of United Oil Well Service

Control of United Oil Well Service, South American servicing firm, has been acquired by Dowell Incorporated of Tulsa. To gain control, Dowell purchased the interests held by Herbert Hoover, Jr., son of the former president of Union Oil Co. of California.

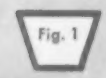
United Oil Well Service will now operate as a subsidiary of Dowell, John G. Staudt, executive vice president of Dowell, announced. United will operate in South America just as Dowell does in the United States.

Top authority in United Oil Well Service is vested in an executive com-

this simple idea cuts V-Belt costs

— as a V-Belt bends, feel its sides change shape!

Pick up any V-Belt that has straight sides (Fig. 1) and bend it as if it were going around a pulley. At the same time, *grip its sides* with your fingers! You will feel the sides *bulge out* as in Fig. 1-A. Clearly, the bulging belt is forced to press *unevenly* against the V-pulley—and this concentrates wear at the points shown by arrows (Fig. 1-A).

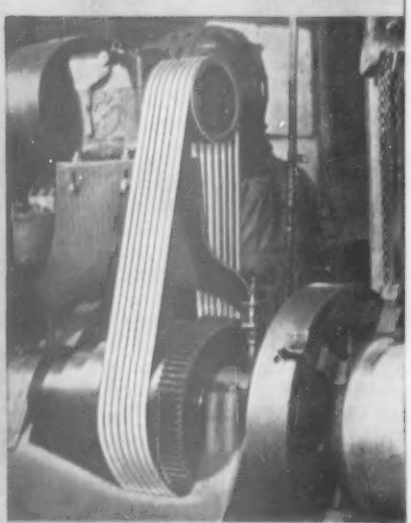


Now bend the belt with CONCAVE SIDES

(U.S. PAT. 1813696)

. . . the GATES VULCO ROPE (Fig. 2)

Instead of *bulging*, the precisely engineered CONCAVE SIDES merely *fill out* and become perfectly straight. This belt, when bent, *precisely fits* its sheave groove (Fig. 2-A). The sides press *evenly* against the V-pulley. Therefore, wear is distributed *uniformly* across the full width of the Gates Vulco Rope—and this means longer belt life and *lower* belt costs for you!



Typical Gates Vulco Rope Drive—the Gates V-belts are built with Concave Sides to insure longer belt wear.

When you buy V-belts, be sure to get the V-belt with the CONCAVE SIDES — the Gates Vulco Rope!

VULCO ROPE

Gates DRIVES

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

THE GATES RUBBER COMPANY
DENVER, U.S.A.
CD-5411

mittee of which Staudt will be president. Other members will be: A. A. Curtice, New York petroleum consultant; E. A. Pielemeier, vice president, United Geophysical Co., Pasadena, Calif.; Lester Swan, executive vice president, Brazos Oil & Gas Co.; and Tromer R. Smith, general manager of United Oil Well Service.

Weatherby Is Welex Sales Engineer At Corpus Christi

W. P. Weatherby has been promoted to sales engineer for the Corpus Christi district of Welex Jet Services, the Fort Worth oil-well service company has announced. Weatherby who has been with Welex for 2 years, will maintain an office in Pleasanton, Tex. Before joining Welex, he had 4 years of experience in oil-well service work.

Baroid Names Simpson to Head Gulf Coast Lab.

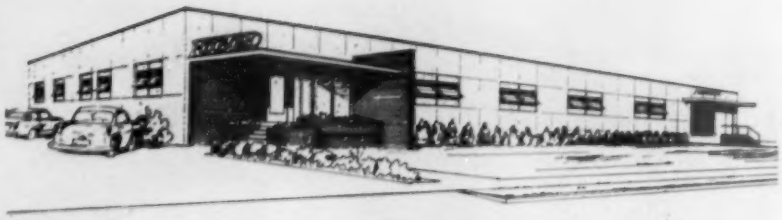
J. P. SIMPSON

Jay P. Simpson has been appointed manager of the Gulf Coast sales and service laboratory of Baroid Division, National Lead Co. The appointment has been announced by George B. Coale, general manager of Baroid.

Simpson was employed by Baroid in 1946 as chemist in the products evaluation section of the Gulf Coast laboratory located in Houston. At that time he was attending the Rice Institute. Upon graduation from Rice with a degree in chemical engineering he continued his employment at Baroid as engineer, working in the drilling-mud-service laboratory and in the field-research mobile laboratory.

At the time of his promotion, Simpson was supervising the work of the Gulf Coast sales and service laboratory and was responsible for training Baroid and oil-company engineers in drilling-mud technology.

The primary functions of the sales and service laboratory include evaluating company products and new mud additives, assisting in the solution of field-mud problems, investigating and developing new techniques of mud control, and assisting grease manufacturers in compounding greases containing Bentone.



New Foxboro Factory Opened in California

This new instrument-service and assembly building in San Leandro, Calif., was officially opened in November by Foxboro Co., Foxboro, Mass., manufacturer of industrial instrumentation. The new factory has more than doubled the company's West Coast manufacturing facilities, providing 8,400 sq. ft. of space for the service, production, and sales departments. It is fully equipped for all types of instrument work ranging from parts replacements, complete repairs, and adjustments to new instrument assembly. In addition, there are assembly sections where Foxboro instruments, such as M/50 consotrol receivers and d/p cell transmitters, are produced. Other sections are devoted to the assembly of control valves and to electronic-instrument work.

Harries Sales & Rental Represents Goodall Rubber

W. A. HARRIES

Harries Sales & Rental Co. has been appointed to represent Goodall Rubber Co. of Texas in the Permian basin area, H. D. Barnard, president of Goodall, has announced. W. A. (Bill) Harries is president of Harries Sales & Rental.

Harries worked for Reed Roller Bit Co. in Oklahoma City for 9 years and then joined National Supply Co. in 1945. He formed his own company in August 1954. His offices are in Odessa, Tex.

R. H. Williams Joins General Metals Staff

R. H. WILLIAMS

Robert H. Williams has been added to the staff of General Metals Corp. as industrial relations director, it has been announced by Wm. E. Butts, president of General Metals. Williams will counsel on and coordinate the various divisional industrial-relations programs within General Metals.

Williams comes to his new post with 18 years of experience in industrial relations, covering labor-contract negotiations, personnel research, accident prevention, supervisory training, wage and salary administration, personnel management, employe services, as well as community and public relations.

Boston Investors Increase Stake in Houston Firm

Recently American Research & Development Corp., Boston, Mass., exercised its option to purchase 75,000 shares of the common stock of Camco, Inc., Houston. This increases the capitalization of Camco by $135,000 to a total of $670,000. Of this amount A.R. & D. has invested $285,000 which includes the new stock issue and $150,000 in 10-year serial notes.

Paul Mills, chairman of Camco's board, stated that they welcomed A.R. & D. as stockholders due to the fact that A.R. & D. has played an important role in enabling Camco to expand rapidly and thereby meet the growing demand for its products.

Camco is a manufacturer of gas-lift equipment. It makes equipment which injects gas into the casing of a producing well and forces the oil that has collected in the tubing. Camco's most rapid growth has resulted from its development of a gas-lift valve that can be recovered and replaced by means of a wire line.

In addition to Camco, A.R. & D. has helped to finance two other southwestern companies serving the petroleum industry.

Camco's new home now under construction in Houston which was made necessary by the wide acceptance of its products in the oil-producing industry. Completion expected about January 1, 1955.

Fluor Assigns Calkins To Head New Denver Office

L. O. CALKINS

M. A. Ellsworth, vice president and director of sales for Fluor Corp., Ltd. has announced the opening of a Denver district sales office. This office will be under the management of L. O. Calkins, district sales manager. Calkins was formerly manager of project coordination at Fluor's home offices in Los Angeles. William Bowles, formerly with Fluor's Houston district sales office will also be transferred to Denver and will serve as district sales engineer.

The Denver office will serve the states of Colorado, Utah, Montana, Wyoming, and New Mexico, plus Southeast Idaho, and the county of El Paso, Tex.

As a result of this and other sales territorial realignments, Fluor's Denver office will be under the direct supervision by George H. Dieter, vice president, western area sales.

C. A. Saville Named Sales Promotion Head by Nelson

C. A. SAVILLE

Charles A. Saville, Nelson Electric Manufacturing Co. employe at the Tulsa home office for the past year, recently has been named sales promotion manager by R. S. Terhune, sales manager. Since joining the organization, Saville has performed special assignments for the company. Much of his work has been in connection with Nelson's building program, including the company's new structure in Tulsa.

Alford Represents McEvoy From Houston Office

Harold Alford has joined McEvoy Co. as sales representative in the Houston office. He has had 11 years of experience in the oil-field supply business and is former city sales representative for National Supply Co.

He joined National Supply after World War II and held positions as clerk, assistant store manager, and field sales representative. He became manager of National's Beaumont, Tex., store and in 1950 was appointed city sales representative in Houston.

Oilwell Completes New Harvey Office and Store

Oil Well Supply Division of U. S. Steel Corp. spotlighted the Louisiana Delta area's growing oil-field activity recently with an announcement that the division's major expansion of its Harvey, La., supply facilities is complete.

M. F. Jones, manager of Oilwell's Gulf Coast area said that work was completed on a modern new building adjacent to the existing unit in the Harvey supply center. The new structure includes both a new store and offices and releases space in the older building for expansion of warehousing operations.

The unit which formerly housed the store is being completely remodeled to serve as a warehouse. It is 80 ft. long and 36 ft. wide. A covered loading dock conveniently accessible from the street runs the length of the warehouse on one side. Floor space in the two buildings, including the loading dock, totals approximately 5,300 sq. ft.

This announcement is neither an offer to sell nor a solicitation of an offer to buy these securities. The offer is made only by the Prospectus.

300,000 Shares

Monterey Oil Company

Common Stock

Par Value $1.00 Per Share

Price $36.50 Per Share

Copies of the Prospectus may be obtained in any State only from such of the several Underwriters, including the undersigned, as may lawfully offer the securities in such State.

Lehman Brothers

Blyth & Co., Inc. — The First Boston Corporation

Goldman, Sachs & Co. — Harriman Ripley & Co. Incorporated

Kidder, Peabody & Co. — Lazard Freres & Co.

Smith, Barney & Co.

Stone & Webster Securities Corporation

Union Securities Corporation

A. C. Allyn and Company Incorporated — Bear, Stearns & Co.

December 9, 1954

Newest Addition to the Drilling Mud Picture

This new Magcobar Headquarters and Laboratory represents another major milestone in the history of [illegible]. It incorporates plans that have been in the making for years . . . facilities dictated by the needs of the oil industry.

Laboratories are the "heart and soul" of this new Magcobar installation . . . because it is through these geological, analytical, research, product development, and engineer training laboratories that Magcobar serves the oil industry with more than mud alone.

Yes, this newest addition to the drilling mud picture . . . by Magcobar . . . will enable you to get far better and more economical drilling mud service today and in the years to come.

MAGNET COVE BARIUM CORPORATION

[illegible] INDUSTRIES

HOUSTON, TEXAS

Magcobar

Complete

DRILLING MUD SERVICE

EXPLORATION

. . . Point of No Return

by Frank J. Gardner

AN important branch of the oil-finding business is in trouble. And because it's important, and because it's in trouble, every other branch must rally to its support.

The difficulties that surround geophysical prospecting can surely be dispelled. The cure for his economic ills lies, of course, with the geophysicist himself, but the more intangible ills will require the efforts of all who look for oil—most especially the geologist.

Early successes . . . For the two professions are essential to each other. The boundary between their worlds has always been a nebulous one because of a broad field of mutual interests. Despite an early air of skepticism, the geologist came to accept the seismic tool as a valuable ally, never quite embracing it and yet compelled to admit its powers. The early successes of the seismograph, the torsion balance, and the magnetometer were phenomenal. But these early successes occurred in the proving ground of the Gulf Coast, where years of geologic study had built a solid foundation of subsurface knowledge and a stockpile of specific problems. The seismic prospector was armed with everything in the geologist's little black book, and his reputation soared as discovery piled upon discovery.

These were the golden days of seismic exploration, and most geophysicists and not a few geologists regarded it as the panacea for all exploration troubles. The geologist had prepared the regional structural and stratigraphic groundwork; the geophysicist stepped in, localized structure, and reaped the discovery glory while the geologist retired to the background.

And later difficulties . . . Then the prospects dwindled. Seismic results became less spectacular as the prospector was forced to move into new and untried areas. He has entered difficult arenas, some with little or no background. He has plunged into difficult terrain, drilled shot holes in the dark in regions of poor-quality returns. He has run into extreme economic difficulties as costs have mounted. His customers and his geologist comrade have lost much of their early confidence as his success ratio has declined. He is near the point of no return. Unhappily, some geologist have taken advantage of the situation to condemn bitterly the weaknesses and failures of geophysics. Smaller oil companies and independent operators who can no longer afford the rising costs of geophysical programs have come to rely on more economical methods of search, and the resurgence of subsurface geology as Method No. 1 is a direct result of the spiraling cost of geophysical exploration.

The geophysicist is not entirely blameless for his plight. In a commendable search for better instruments, he has become less and less the oil man and more and more the robot, subconsciously seeking the mystical Instrument X. He has thrown too many crews, inadequately trained and inexperienced in interpretation, into too many virgin fields. Result—poor information. End point—loss of confidence, idle crews.

Economically, geophysics is in a bind. Payrolls are more than double those of 1940. Over-all costs are 40 per cent over 1945. Revenues have not kept pace—up 15-17 per cent. Profit is down—12 per cent now, compared to an earlier 25.

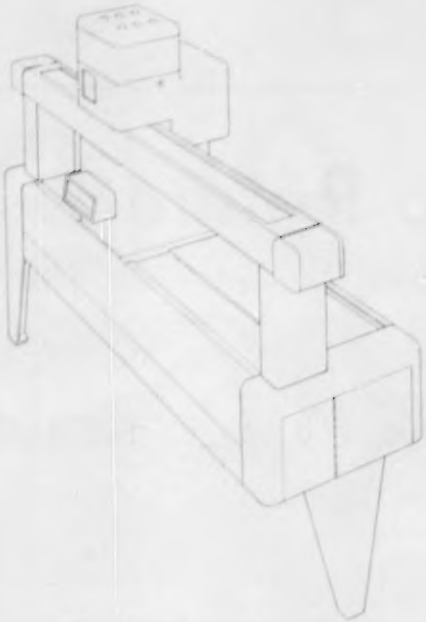
The declining success ratio, the idle crews, and the economic problems, plus the increased efficiency demands of clients have compounded the geophysicist's woes.

Call for a new approach . . . What can he do? There are, according to some, three possible alternatives: find some way to cut his rates, produce better information and consequent better successes . . . or go out of business. It is to the interest of everyone in the oil industry that he take the middle course. And it is the geologist's responsibility to assist him.

The fundamentals of oil finding have not changed—only the targets, which have gone from the obvious to the obscure. The day has arrived when the chasm between geology and geophysics must be bridged, not widened. The techniques of one must become the techniques of the other. Many problems of one are the problems of the other—the origin of oil is just one of these—and the future of both may well depend upon their solution. No Instrument X for the direct finding of oil is in view, and the call now is for cooperation of both professions in a concentrated study of oil environments as a prelude to detailed reconnaissance in any area.

The geologist must feel that a seismic survey of an area is necessary before any geophysical crew is sent into it. He must supply that crew with every scrap of available geological information before it goes in—surface, subsurface, logs, maps, and existing geophysical dope. He must devote more time and study to an understanding of geophysical techniques and problems. He must recognize the need for the geophysicist's findings and contribute an indispensable background to proper interpretation of those findings.

The geophysicist must pay less attention to instrumentation and more to interpretation. He must have more geological training. He must come out of an area with more than seismograms; he must come out with a geologic map—or at least a set of records that are readily comprehensible to the geologist. He must have more imagination. More ideas. People must replace machines in his thinking, and any new machines must serve both professions. One such new machine is described in the pages that follow, and undoubtedly others will come. His troubles are there, all right, but it has been proved many times that troubles only stimulate loftier efforts. These, too, will come.



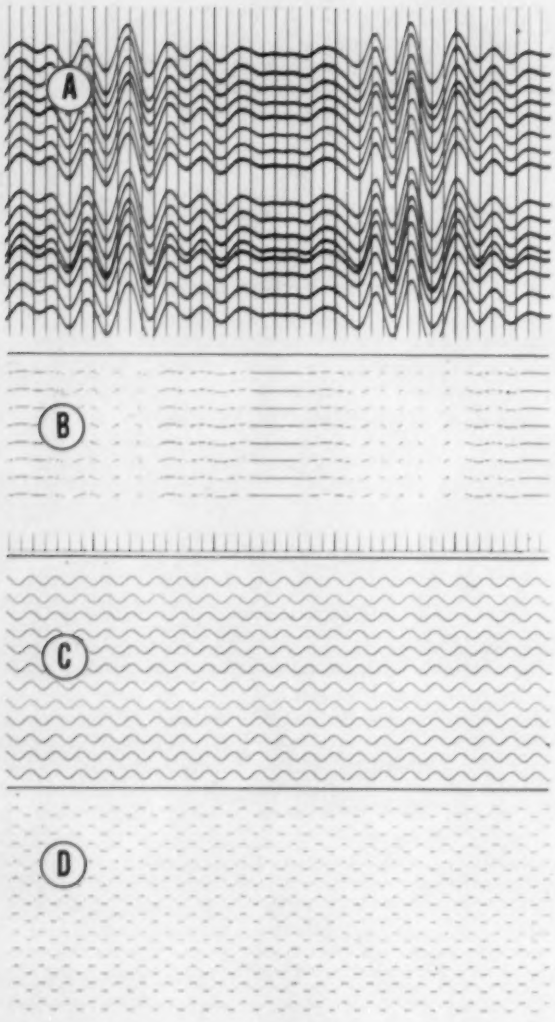


Fig. 1—Comparison (right) of a normal 16-trace record (A) with a Reynolds 8-trace record. The amplitude of the traces can be reduced (C and D) so that no traces overlap.

Fig. 2—The Reynolds Plotter, shown above, automatically works up the seismic records into a finished cross-section, apart from migrating dips.

Revolutionary new method promises

Better Seismic-Reflection Computations

1. By increasing accuracy of interpretation

2. By keeping computing up to date at all times

by John W. Flude

EVERYONE who has had anything to do with the computation of seismic data from high-speed offshore crews must have wished for a better way of handling the data. Anyone who has had a part in interpreting seismic data from land or offshore crews must have longed for a satisfactory way of using all the seismic data on the records in making their interpretation. Everyone who has paid for a seismic program has hoped that interpretation could be more accurate and very often wished it could be more timely.

In the more than 20 years that the reflection seismograph has been in use, it must be said that there have been improvements. For the most part the improvements have been instrumental, and many of them tend to increase the load on the computers since the number of records taken is greater.

The necessity . . . We have greatly increased the number of traces on our records but we get little more information from each record than previously. Most of us use only the information from the first and last traces or from the two middle traces, the other traces being used only to identify and qualify reflected energy. Reflections are plotted on a per record or per shot-point basis and it is rarely that segmental information—from just a part of a record—is picked and plotted. It would be extra-

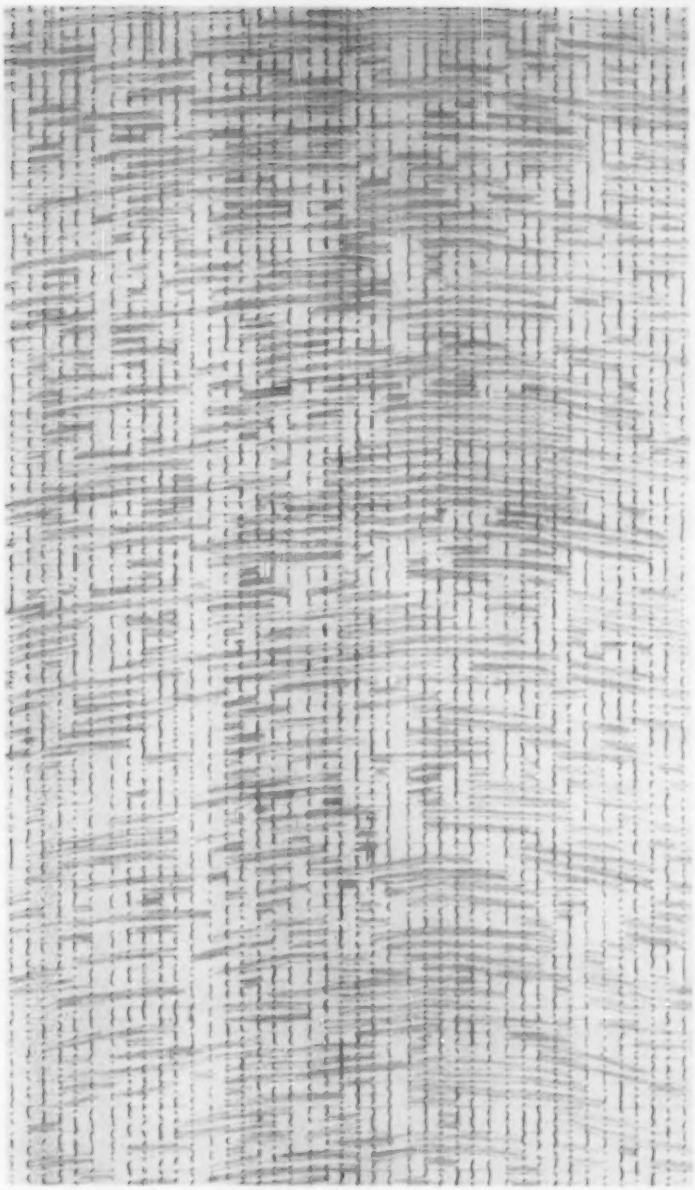


Fig. 3—Shaded areas in the above section represent reflecting horizons and show the anticline.

ordinary to find a reflection picked from a part of two records and plotted, and it would add a great deal to the computers' burden to do so.

Further, reflection picking tends to be conservative, especially when records are good. Only the prominent reflections will ever find their way to the plotted cross-sections and less prominent events which, for all we know might be very important, remain unused in the records. In reworking a prospect, old picks would be checked but new picks would be made infrequently.

The mass of data brought in by an offshore crew is so great that it requires a large computing force to prepare the data for the geophysicist responsible for the final interpretation. The computing force is broken down into groups and each group is assigned a portion of the records—say from a sector of the total area or along a particular traverse line. Each group works its data clear through to the cross-sections. The final interpretation, then, amounts to reconciling the interpretation from each sector into an over-all picture. The one making the over-all interpretation would never have the time to go over the records though he might be able to study a few critical records.

The method . . . It is believed that at long last, a method is available that will, in proper hands, vastly increase the possible accuracy of interpretation and keep the computing up to date at all times. This method is known as the Reynolds Cross-Section Plotter, the invention of V. T. Reynolds, a geophysicist of many years' standing.

Fundamentally, the Reynolds Plotter, by manual, electric, optic, photographic, and mechanical means, corrects each used seismic trace for elevation or water depth, weathering, and step out, makes use of any desired velocity curve, and then plots these traces in their correct horizontally surveyed positions on paper on which the final interpretation is made. The plotted information, therefore, is the original seismic data, and easily recognizable as such, expanded according to the correct velocity for the area, and to the same scale normally used in preparing cross-sections. Reflection "picks" are made directly on the cross-section and anywhere they appear, not necessarily outside or inside traces, but all traces that show the reflection. The plotted information is unmigrated but migration can be done conveniently on the back of the section by a conventional migration plotter mounted on a shadow table.

All data, even from a high-speed offshore crew, can be plotted 8 hours after the records are received, and by a much smaller computing staff. Only one person need be involved in the interpretation. Cross-sections may be duplicated for any number of check interpretations.

Fig. 1 shows part of a record taken with a dual recording oscillograph, showing a 16-trace normal record and an 8-trace record taken by Reynolds' process. With Reynolds' method every other trace is recorded. The records are taken with a full envelope (within some limits) and reduced in amplitude by optical means so that no trace will overlap another.

The machine . . . In the office a contact printed, photographic negative film is made of the Reynolds-recorded part of

THE AUTHOR

John W. Flude is president of Offshore Exploration Group, Inc., of Houston. He is a graduate of University of Illinois, and has been active in the field of geophysical exploration since 1927, when he joined Geophysical Research Corp. in Louisiana. In 1932 he assisted in the organization of Independent Exploration Co. and served as its secretary-treasurer for 9 years. He holds 14 patents in the United States, Canada, and Mexico relating to marine geophysical exploration.

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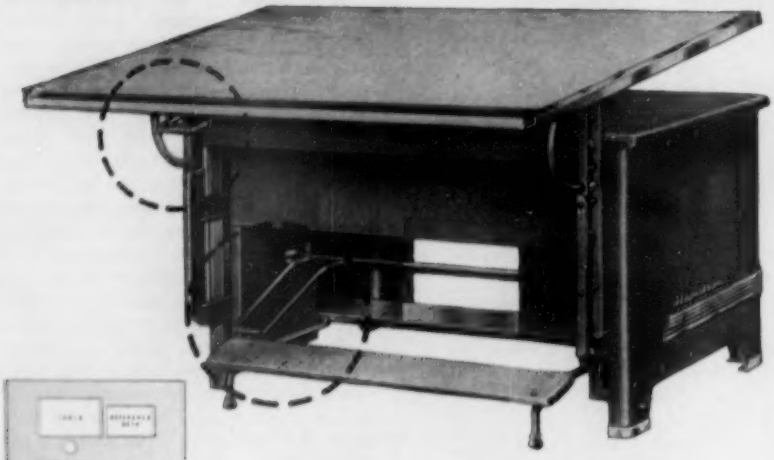

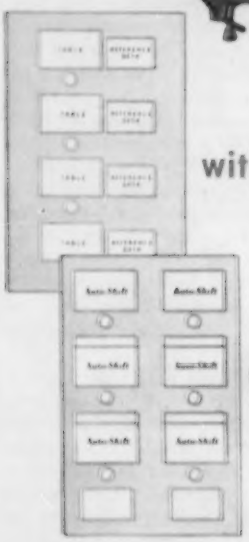

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the record. That film is then introduced into the computing machine, a sketch of which is shown in Fig. 2. This greatly improved machine is being built at this time.

In the computing machine there are means for adjusting the traces for surveying distances. Corrections for weathering, elevation or water depth, and for move-out time are applied by manual adjustments. The negative film is held in a fixed position while an optical light system sends a beam through the negative to produce the positive print on a roll of sensitized paper or film which will become the cross-section. The light beam travels the length of the negative at a speed proportional to the velocity for the area. Also, the roll of cross-section material moves, parallel to the negative, at a speed proportional to the velocity.

Thus, the finished print appears on the cross-section with each trace corrected to a datum and in its proper surveyed position, showing all reflected events at the points on the cross-section from which they appear to emanate (except for migration). Since the traces are printed across the roll, a cross-section of any length up to 100 ft. is possible.

In Reynold's original system a mask, or screen, was used in the oscillograph to blank out the peaks and troughs of reflections. There will be a difference of opinion on whether to have such a screen, or what form it should take. Among those who have signified their intention to use the method are advocates for using a full envelope; others for cutting off the peaks and troughs. Some have suggested retaining only the peaks and troughs. However, any desired mask or screen will be placed in the computing machine rather than in the oscillograph.

It will be possible at a later date to handle magnetically recorded data on this same machine. Also, it will be possible to convert the negative strip film to a normal seismic record.

The record . . . A part of a typical cross-section is shown in Fig. 3, as worked from Reynolds' first machine, and the peaks and troughs are cut off. It may not be apparent immediately that quality and "character" may be judged as easily as with conventional records but with a little experience this becomes true.

Using peaks or troughs, or both, the interpreter draws his horizons through any or all reflected events indicated on the cross-section, making use of every trace which shows the chosen event, without regard to shot point or end traces. Often, picks may be made over a very few traces that will assist the location of a fault or will indicate some

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very steep dip associated with structure which almost certainly would have been passed up by conventional methods.

The effects . . . Geologists, even with a limited geophysical background, will find that they can assist in the interpretation, or check the geophysicist's interpretation with more confidence than they might feel with conventional computing methods.

Exploration costs will be slightly increased through use of the method. This increase comes from the rental of the computing machine and the processing of the strip film. Use of the method can materially reduce the computing staff required by an offshort crew but, due to the large number of records taken, the cost of the strip-film processing, unless that can be reduced, may offset the saving in manpower. Since the method will simplify recomputing, it is likely that the over-all cost will be no greater, and perhaps less, than conventional computing.

Only one machine . . . There is only one Reynolds computing machine in existence today; the one Reynolds built himself. That one machine is available for use up to its capacity. A number of new machines with numerous improvements are being built by Southwestern Industrial Electronics Co., and will be delivered before March 1, 1955. In the meantime it is possible to adapt oscillographs to take records for the one existing machine, up to its capacity, or to adapt oscillographs to take records for processing in the new machines when they become available. In the latter case, the sections would be used as a recomputation check.

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Exploration Highlights

MID-CONTINENT

KANSAS

Lansing Producer Seen For Rush County Area

Rush County has a new Lansing producer assured at Republic Natural Gas Co. and Natural Gas & Oil Co. 1 Webs "C", NE NE NE 16-19s-20w.

The discovery reported a test of 62 bbl. of oil in 1 hour from perforations at 4,216-18 and 4,202-12 ft. The well made 35 bbl. of oil the first hour. The second hour showed 50 bbl. and the third showed 62 bbl.

The new pool-opener is located 6½ miles northwest of Pawnee County's Shiley field. Operations are already under way at a second test in the area, the 1 Young "F", SW NW NW 15-19s-20w. Surface pipe is set at 204 ft.

A New Lansing discovery was reported on the southwestern flank of the Central Kansas uplift in Rush County.

Ellsworth County Has Promising Arbuckle Strike

The Texas Co. 1 Urbanek, NW NW NE 15-16s-10w, 1 mile east of Stoltenberg field in Ellsworth County, is a promising new Arbuckle oil discovery well.

A drill-stem test at 3,411-31 ft. recovered 2,340 ft. of oil and 210 ft. of watery mud-cut oil.

Barber County Records Another Promising Strike

Aurora Gasoline Co. and Jones, Shelburne & Farmer 1 McKeever, SE SE SE 13-32s-10w, Barber County, recovered 4,250 ft. of clean oil on a drill-stem test of the Mississippian at 4,350-70 ft.

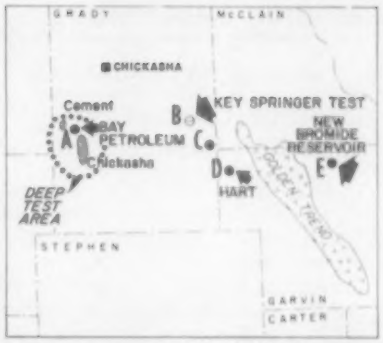
A drill-stem test at 4,330-50 ft. got 60 ft. of slightly oil and gas-cut mud, 30 ft. of oil and gas-cut mud, 30 ft. muddy oil. The wildcat is 5 miles southwest of Dusenberry pool.

OKLAHOMA

Year-End Activity Takes Big Stride Forward

The year 1954 has been one of the busiest in Oklahoma's long drilling history. Every area in the state, both shallow and deep, has set new drilling records. Important discoveries have been noted in every producing county in the state. Development drilling promises to remain high in future months.

Major field . . . Marshall County in southern Oklahoma has a major oil field in prospect at Sinclair Oil & Gas Co. et al 1 Griffin, SE NE NE 16-5s-5e. The significant multi-pay prospect is at total depth of 7,550 ft.



Oklahoma nears end of significant wildcat year. Deep Grady-Garvin play keynotes current activity.

Core tests of the basal Oil Creek sand, found at 7,442 ft., show 25 ft. of gas-condensate pay in the upper part of the sand with 80 ft. of oil column to present depth. The zone was cored to 7,550 ft. More than 360 ft. of effective pay sand was found in the Bromide sand, entered at 5,699 ft. More Oil Creek sand is to be drilled into. The operators found oil and gas showings in the Springer, Sycamore, and Viola.

Garvin County hit . . . A Bromide sand reservoir was recently opened in southern Oklahoma at Stanolind Oil & Gas Co.'s wildcat near Maysville Townsite field (E on map).

The discovery, located in SE SW SE 14-4n-2w, flowed 1,066 bbl. of 40°-gravity oil per day from 5,936-44 and 5,972-78 ft. The discovery well is the 1 Pitchlynn.

- Also in Garvin County Cities Service expanded Hart sand production in NE NE 17-4n-4w. The discovery flowed 35 bbl. per hour from perforations at 8,142-62 and 8,248-62 ft. (D on map).

Grady County . . . The two most active areas in Oklahoma are located in this county . . . Chickasha and Bradley. The latest development in the Chickasha area is the successful attempt to evaluate the Noble Olson in 16-5n-8w (A on map), between Chickasha and East Cement fields. Deep tests are under way in 4n-8w and 5n-8w (A on map).

- Sinclair Oil & Gas Co. shows promise of expanding Springer production several miles north of current production at a wildcat in 8-5n-5w (B on map). The Ordovician is being played in 26-5n-5w (C on map).

Success Noted at Northwest Edmond Extension

A high flow capacity has been reported at an expansion well in North-

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west Edmond field, Oklahoma County.

Mohawk Drilling Co. 2 Bernstein, NW NW NW 19-14n-3w, previously tested 6 bbl. of oil hourly from Simpson dolomite through perforations at 6,342-76 ft. A flow capacity of 52,000 M.c.f. of gas per day with 26 bbl. of condensate per million cubic feet was reported at 6,534-54 ft. in the second Wilcox sand.

Viola Approached at Marshall County Offset

Operators are nearing the Viola lime at the first offset to Sinclair et al's multipay discovery north of Madill.

Buffalo Oil Co. and Wayne Beard 1 Olmsted, NE SW NE 16-5s-5e, expects the Viola at about 4,395 ft. Hole was being cut at 4,370 ft.

Deese Pay Extended in Garvin's East Brady Area

Deese sand pay in the East Brady district of Garvin County has been extended by James B. Kite at 1 Carlisle, NE NW SE 24-2n-1w.

Recovery on a drill-stem test in the first Deese sand at 4,507-37 ft. was 2,160 ft. of 29°-gravity oil.

HUGOTON EMBAYMENT

OKLAHOMA PANHANDLE

Cimarron County Keyes Area Gets Extension Oil Well

An oil extension on the northeast side of Keyes gas field in Cimarron and Texas counties, Oklahoma, has taken potential gage.

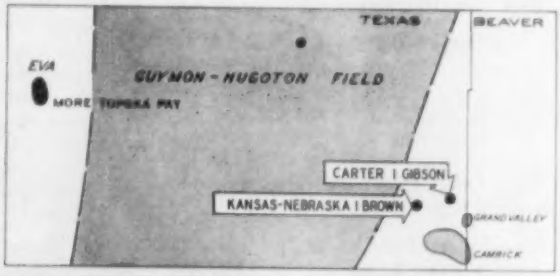
Shell Oil Co. 1 State Unit "B," NE NE SW 30-6n-10eCM, flowed 166 bbl. of oil per day on ½-in. choke. The pay is the Keyes sand (basal Morrow-Penn). Perforations were at 4,638-42 ft. Nearest flank oil well in the area is about 2¼ miles northwest.

Dry hole . . . Shell has abandoned another well in the area, the 1 State-Meade Unit, NE NE SW 27-6n-9eCM. The well earlier had indicated oil success.

Texas County's Big Camrick Field Area Records Extensions

Major extensions are reported in Texas County, Oklahoma's fast-growing Camrick field, a Pennsylvanian producing area. The Kansas-Nebraska Natural Gas Co., Inc. 1 Brown, NW NW SE 25-2n-18eCM, gaged gas at 5,780 M.c.f. per day on drill-stem test in the Morrow sand at 6,440-73 ft. A test at 6,475-6,525 ft. got 3,785 M.c.f. of gas per day at the end of test. Drilling continued.

This extension discovery prospect is 3¼ miles northwest of nearest Camrick field Morrow wells. It is about 6



Major extensions completed and indicated in Texas County's prolific Camrick - Pennsylvanian field in the Oklahoma Panhandle.

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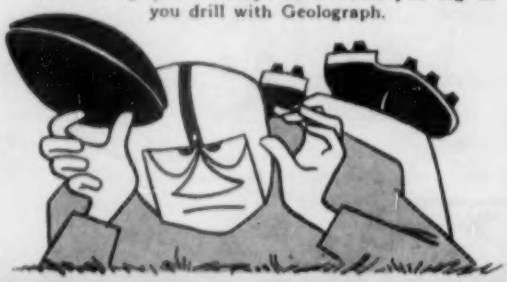

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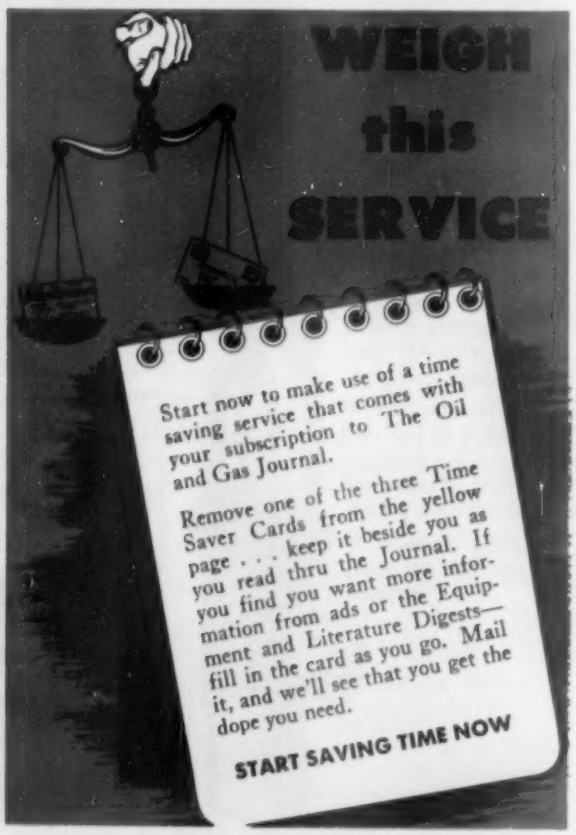
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miles west of Grand Valley-Morrow field.

More success . . . Potential gage has been reported at Carter Oil Co.'s major Camrick field extension, the 1 Gibson, SE NE 21-2n-19eCM.

This well flowed 12,000 M.c.f. of gas per day after acidization of perforations in the Morrow at 6,464-71 ft. This well is 2 miles northwest of Grand Valley production and 4 miles north of Camrick field.

Topeka pay strike . . . Up in the northwestern part of the county at Eva field, United Carbon Co., Inc. 10 Kelley, flowed 3,360 M.c.f. of gas per day from perforations at 2,930-36 ft. in the Topeka lime.

Final gage gives the field another new-pay hit. The field also has Morrow and Cherokee pays, all Pennsylvanian.

WESTERN KANSAS

Production Tests Get Under Way at Haskell Confirmation

Helmerich & Payne are taking production tests at 17 Jones, NE NE SW 9-27s-34w, confirmation well to recently-opened Pleasant Prairie field (Mississippian). The Pleasant Prairie field discovery well opened first oil production in Haskell County. It also opened oil production inside Hugoton gas field in the area.

The 17 Jones earlier flowed an estimated 3,000 M.c.f. of gas per day on a drill-stem test at 3,880-3,900 ft. This zone is believed to be either Topeka or the Heebner.

Potential Taken at Ford County Confirmation

Potential has been taken to the confirmation well of South Pleasant Valley field in Ford County.

W. J. Coppinger et al 1 Kirkpatrick, a 1¼-mile south outpost to City Products Corp. 1 Vice, the field discovery well (Mississippian gas), flowed 3,800 M.c.f. of gas per day from perforations at 4,986-5,014 ft.

TEXAS PANHANDLE

Potential Gage Taken At Hansford Link Well

Humble Oil & Refining Co. has taken potential gage at a link well 1½ miles from Gruver field and the same distance from Fulton 1 Matthews.

The 1 Gruver Gas Unit 7 (Sanders), Section 113, Block 45, H&TC Survey, flowed 9,000 M.c.f. of gas per day from the Morrow sand. Perforations were at 6,931-45 ft. The well joins the Morrow discovery at Fulton 1 Matthews with Gruver field.

Significant Confirmations in Dallam and Ochiltree Are Dry

Sun Oil Co. has abandoned a ¾ mile north outpost well to Dallam County's first producer, Humble 1 Kerrick gas unit 1. The outpost failure is 3 miles southwest of Kerrick. It reported no shows on cores from the Pennsylvanian.

In Ochiltree County The Texas Co. 1 Daniel "B," 9 miles southeast of Waka, was plugged in the Mississippian at total depth of 8,339 ft. The well was intended as a confirmation to the 1-A Daniel Atoka and Morrow gas discovery.

PERMIAN BASIN

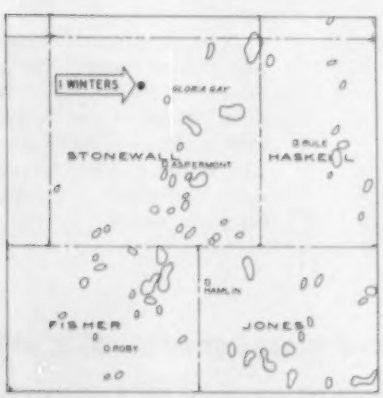
WEST CENTRAL TEXAS

Stonewall Test Flows From Bend Conglomerate

Texas Pacific Coal & Oil Co. 1-1 Winters, wildcat 4 miles northwest of Gloria Gay field, had prospects of opening a new Pennsylvanian pool. A drill-stem test in the Bend section at 6,255-6,311 ft. developed flowing oil in 51 minutes, estimated at 10-15 bbl. an hour. Recovery in the pipe was 3,600 ft. of 38° oil, 270 ft. of salty mud and 1,350 ft. of drilling fluid. Operators continued drilling, on an Ellenburger contract.

New pay prospect in Nolan . . . Pennsylvanian oil, fourth pay zone for the E. A. field in southeastern Nolan County, is indicated at Humble Oil & Refining Co. 3 Petty, in Section 6, Block Z, T&P Survey, 8 miles northeast of Blackwell.

Three drill-stem tests between 5,014-



Texas Pacific Coal & Oil Co. 1-1 Winters opened a new Pennsylvanian pool with a flow estimated at 10-15 bbl. an hour.

5,139 ft. developed oil; the first unloaded oil while coming out, the second had flowing oil but was shut in, and the third recovered oil in dripp pipe. Shut-in pressure was 1,830 psi. on all tests. Top of the Pennsylvanian reef was 5,013 ft. on elevation of 2,517 ft.

The well also recovered oil on a test of the Cambrian at 6,215-25 ft. Operators plugged back to complete as a Pennsylvanian well. Other pays include the Goen limestone, Ellenburger and Cambrian.

WEST TEXAS

Tom Green County Wildcat Flows Strawn Oil

Attention of oil finders has been turned again to southern Tom Green County, near Christoval, where another Strawn strike is in the making.

American Trading & Production Co. 1 Tom Green County, J. Zerbach Survey, logged oil-bearing sand between 5,335-5,409 ft., and at this writing was drilling ahead toward contract depth of 6,500 ft.

First drill-stem test of the Strawn to return oil was from 5,335-68 ft., where recovery was 630 ft. of clean oil and 150 ft. of heavily oil-cut mud in 2½ hours. Second test, from 5,335-5,409 ft. had gas in 30 minutes and recovered 90 ft. of oil plus 315 ft. of heavily oil-cut mud. Flowing pressure was 150 psi. and 40-minute shut-in pressure reached 1,965 psi.

Location of the well is 1½ miles east of Christoval townsite on public park lands owned by the county. Nearest production is the South Christoval pool, 2½ miles southwest, which has two wells producing from the Strawn.

SOUTHEAST NEW MEXICO

Texas Pacific and Union Oil Co. 1 South Cross Roads Unit, Devonian prospect south of Cross Roads field, continued testing the Devonian. Swabbing on perforations at 12,254-94 ft. yielded 187 bbl. of new oil in 13 hours.

Farther south is the H. J. Strawn field, where 12 wells are on production.

Low well in Ellenburger trend . . . British-American Oil Producing Co. 2 Roy Parks, west offset to the firm's big Ellenburger discovery, or southeast extension to Headlee field, was checking low to that discovery on the Ellenburger top. Sample top on No. 2 was 13,259 ft., minus 10,384 ft., which correlated 192 ft. low.

The west dip is expected, but the tentative reading is steeper than anticipated.

However, drill-stem test at 2 Parks, from 13,261-13,321 ft., had oil in 12 minutes, which flowed at the rate of 75 bbl. an hour through ½-in. choke.

Southland Royalty Co. 1 Parks, east offset to British-American's 1 Parks, entered the Ellenburger at 12,903 ft., minus 10,021 ft., which was high to the discovery. On completion test the well flowed 556 bbl. of oil through ½-in. choke, from perforations at 13,210-40 ft., and was given a daily potential of 2,426 bbl. Gas-oil ratio was 900:1.

Crane test high . . . British-American 1-B Tubb, long south offset to the firm's 1 Tubb Ellenburger discovery (Ward County), picked sample top on Ellenburger at 7,950 ft., or around 103 ft. high to the discovery. Operators started

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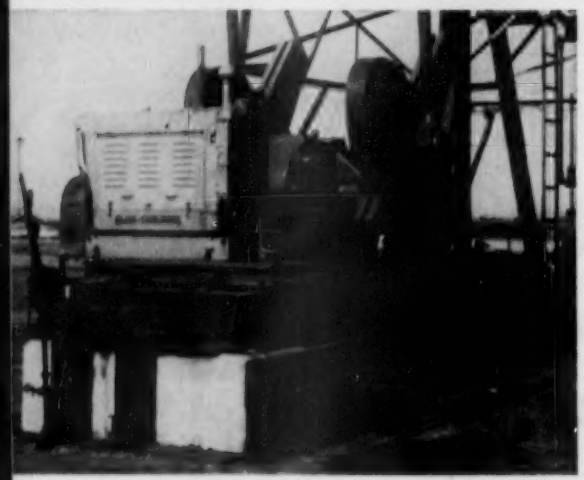

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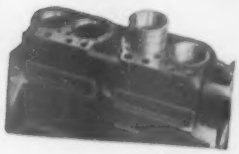
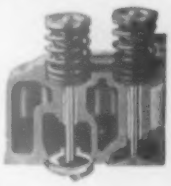
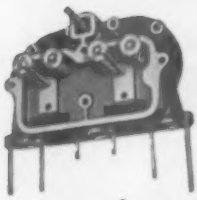


Valve-in-Head construction



and on the larger size engines one Interchangeable



Head to each two cylinders. Permits one

man to make repairs at the location.

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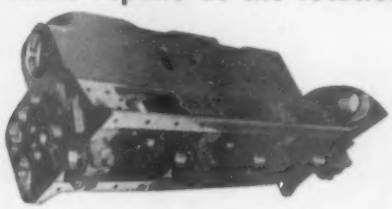

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coring at 7,940 ft. and plan to core to 7,998 ft. before testing.

Devonian Project Planned

J. C. Williamson, Midland, has scheduled a 12,800-ft. Devonian wildcat 7 miles northwest of Denton field in Lea County. The project will be 1-A-1 Reed in 1-14s-36e.

ARK-LA-TEX

ARKANSAS

New Gas Field Opened In Rank McAlester Area

A rank gas discovery was reported in the Moreland area of south-central Pope County, 8½ miles northeast of Russellville.

Murphy Corp. 1 Barton, C NE SW 10-8n-19w, 1 mile south of Moreland, flowed 1,900 M.c.f. of dry, sweet gas per day on ¼-in. choke with tubing pressure of 1,300 psi. Production was from perforations in the Atoka sand at 3,993-4,003 ft. The hole is bottomed in the Hale at 5,508 ft. Nearest production to the new discovery is Tates Island field, 12 miles northwest. An offset is planned soon.

New Atoka Gas discovery for Arkansas . . . located in rank Pope County area.

Kiblah Field Currently Has Three Rigs Active

Kiblah field in 20s-26w has three rigs running at the present time. One additional rig is running at a wildcat north of present production in the field. H. L. Rowley's 1 Terry Unit, NE SE SE 4-20s-26w, is drilling at 3,618 ft. Milton Crow, Inc., has two rigs in the field. ● Benedum-Trees Oil Co. has a good oil field in Lafayette's Kiblah field. The 3 Caldwell & Lowe, C NE NW SE 3-20s-26w, flowed 245 bbl. of 46°-gravity oil per day on 10/64-in. choke. Perforations were at 5,996-6,011 ft. This is the best Mitchell sand section logged in the area.

NORTH LOUISIANA

Claiborne Parish's Antioch Field Gets Smackover Strike

Stanolind Oil & Gas Co. finaled a Smackover discovery in Antioch field, Claiborne Parish. The 1 Mary Ann

Smackover found at Antioch in Claiborne Parish.

Washington, 28-22n-5w, ¾ mile north of Holsey, flowed 193 bbl. of 54°-gravity crude oil per day on 10/64-in. choke.

Perforations were at 10,358-89, 10,398-10,404, 10,413-21, and 10,433-35 ft. Gas and oil pay was also indicated on test of the Haynsville at 10,119-60 and 10,163-10,260 ft.

DeSoto Parish Has Gas Southeast of Gloster

A dry gas discovery was reported at N. B. Hunt 1 Oden, 35-14n-14w, DeSoto Parish. The Eagle Ford gas well had an estimated open flow of 20,000 M.c.f. per day from perforations at 2,854-62 ft. The well is shut in for connection.

Condensate Shows Reported At Greenwood-Waskom

Good shows of gas-condensate have been recovered at a well in Greenwood-Waskom by Stanolind Oil & Gas Co.

The 1 Hunter, C NE SW 28-17n-16w, Caddo Parish, reported the shows on a core of the Cotton Valley "D" sand. The prospective hit is about 3 miles southwest of the field's "D" sand production.

New Field Opened at Catahoula Parish Wildcat

E. C. Wentworth has completed the discovery well of new River Slough field in Catahoula Parish, east-central Louisiana.

The 1 Rhone, a Wilcox discovery at 5,311½-13½ ft., is located in C NE NE 7-6n-7e. It pumped 50 bbl. of 39°-gravity oil per day on ½-in. choke. The new pool is about 1 mile southwest of Ross Bayou field. Two offsets, a north and west, have been staked.

EAST TEXAS

Henderson County Field Extensions in Prospect

A flush producer on the southern tip of South Malakoff (Bacon limestone) field of southwestern Henderson County, plus a new well over 1 mile north of present production, were highlights of East Texas activities this week. The latter well is Thomas D. Humphrey & Sons 1 Sheppard, John Allbright Survey, A-16, which on initial tests showed for the highest production in the field.

No. 1 Sheppard acidized perforations at 7,658-66 ft., then kicked off to flow at the rate of 18.37 bbl. of oil an hour. Operators were running potential test at last report.

The same firm's 1 Faulk, in the same survey and also an extension test, was waiting on cement after running casing to bottom at 7,645 ft.

On the southern tip of the field, Fryer & Hanson Drilling Co. 1 Smith estate, Jose M. Alpando Survey, has been completed for a daily flowing po-

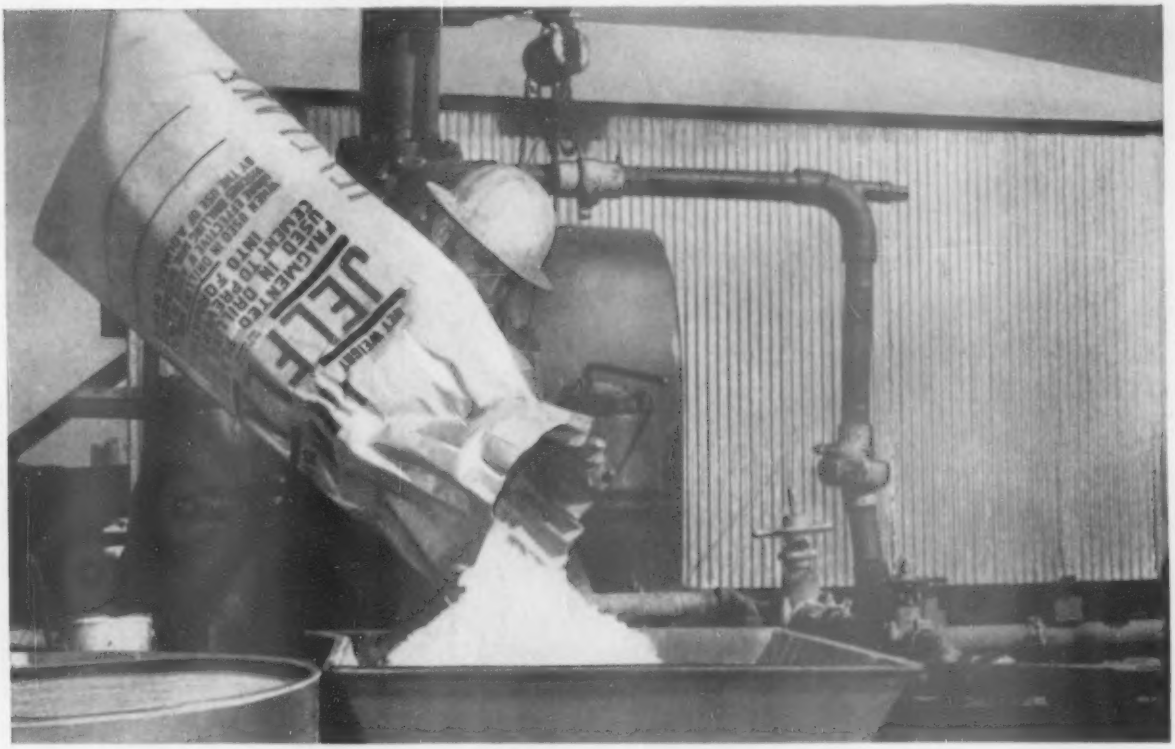
Two extension tests, one an assured producer, north of South Malakoff pool in Henderson County. Arrow points to Thos. D. Humphrey & Sons 1 Sheppard, flowing well ready for completion.

tential of 324 bbl. through ¼-in. choke from perforations at 7,472-92 ft. Gas-oil ratio was 917:1 and tubing pressure was 650 psi.

Deep wildcat for Bowie County . . . Humble Oil & Refining Co. has made location for a 12,000-ft. Smackover test in the John McMullin Survey, approximately 6 miles northeast of Douglass-

JELFLAKE STOPPED MUD LOSS WHERE COTTONSEED HULLS FAILED

Feather-light, graded plastic particles sealed off thief zone in minutes with plugging and plastering action



Over 24 tons of mud was lost at 6,440 feet in a drilling well. Twenty tons of cottonseed hulls were pumped into the well without restoring circulation. Then 300 pounds of Jelflake®—fragmented plastic foil—was added to a new pit of mud. Circulation was restored as soon as the *Jelflake*-laden mud reached the porous zone.

Results like this illustrate how Jelflake can be used to cut costs on drilling and cementing jobs.

Jelflake particles are graded to work two ways: First, the smaller sized flakes penetrate into formation pores to plug them. Second, the larger pieces are designed to plug and plaster themselves over the formation face and form an impervious filter cake, capable of withstanding high pressures.

The flakes have a crinkled surface which helps them to disperse readily into mud without balling. They are thin and pliant—and penetrate irregular-shaped openings readily. The contents of one 25-pound bag can cover over a half-million square inches of formation surface.

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ville. The project will be drilled as 1 Beltex Lumber Co. Humble is reported to hold a 2,132-acre lease.

GULF COAST

SOUTHWEST TEXAS

Starr County Wildcat Tests Gas-Condensate

Selby-Walker Corp. is testing gas-condensate showings encountered in its 1 Rose, a wildcat in San Jose Grant, 2 miles north of LaReforma, in northeastern Starr County.

Completion is expected to be made in sand interval at 7,454-60 ft., from which, in a preliminary drill-stem test, heavily gas and distillate-cut water cushion was recovered. The test recorded working pressure of 700 psi. and shut-in pressure of 900 psi. Bottom-hole flowing pressure was 4,150 psi.

Possible oil or gas production also was indicated in tests of intervals at 7,497-7,515 ft. and 7,192-96 ft.

Chalk Discovery Indicated

A small oil producer in Austin chalk is being completed by M. P. Wilson at his 1 Kubela, a wildcat in the E. Bollinger Survey, 7 miles southwest of Seguin, in Guadalupe County. Initial tests recovered approximately 40 bbl. daily. Pay is perforated at 1,528-40 ft.

Started as a test to the Trinity section, the well was drilled to 4,009 ft. It tested water in the Glen Rose at 2,512-30 ft.

New Pay at Palo Blanco

John L. Sullivan has opened a new pay zone in Palo Blanco field, Brooks County, with the completion of his U-10 Alexander as a 52-bbl. oil well, flowing through 7/64-in. choke from sand interval at 2,460-80 ft. Flow was under pressure of 450 psi. and gas-oil ratio of 720 cu. ft. per barrel. Oil-gravity is 36°.

TEXAS GULF COAST

Live Oak County Strike Indicates New Oil Field

A new oil field is in the making 8½ miles southeast of George West, in Live Oak County, where Appell Drilling Co., of Alice, Tex., is attempting to complete its Northern Royalty, a wildcat in the Thomas Castillo Survey 61, as a producer in 4,350-ft. sand.

Oil production was indicated in an open-hole drill-stem test prior to running casing. The test, taking in sand

Location (arrow) of Appell Drilling Co.'s oil discovery in Live Oak County.

interval at 4,345-51 ft., filled 200 ft. of pipeline oil. With the well shut in, pressure built up to 1,750 psi. in 15 minutes. Casing was run to 4,347 ft.

Location is north of Fort Merrill field.

Bee Wildcat Tests Gas

Humble Oil & Refining Co. has a new gas-discovery well in western Bee County. Its 1 Carpenter, in the R. P. Little Survey, 8¾ miles northwest of Beeville, has been completed with an absolute open-flow gage of 5,410,000 cu. ft. per day. Completion is in sand interval at 9,114-28 ft. Location is east of Theis field, and southwest of Holzmark field.

New Oil Area Opened in Western Harris County

Discovery of a new oil-productive area 1¼ miles south of Satsuma field and 4 miles west of Fairbanks, in western Harris County, is reported by J. M. Flaitz and R. B. Mitchell, Houston independents.

Their discovery well, 1 Wise, in the H. C. McIntyre Survey, testing sand, perforated at 7,315-19 ft. and 7,322-25 ft., flowed 40.07 bbl. of 43°-gravity net oil in 24 hours through 12/64-in. choke. Flow was with gas-oil ratio of 630 cu. ft. per barrel. Oil recovery was with approximately 25 per cent of total fluid production.

Third Producer Confirms Tamina Area Extension

The Tamina area, 7½ miles southwest of Conroe in southern Montgomery County, is getting its third oil producer, confirming the 1½-mile northeast extension made by the second well.

All wells were drilled by Magnolia Petroleum Co. The new producer, 1 Mixon, testing the area's Yegua pay, perforated at 9,151-63 ft., flowed 10 bbl. in 5 hours through 20/64-in. choke.

Location is 1,320 ft. northeast of the area's second well, 1 Arcenaux, completed in October with a potential rating of 113.7 bbl. of 36.9°-gravity oil daily through 9/64-in. choke with pay interval at 9,172-75 ft.

The Arcenaux well is 1½ miles northeast of the discovery well, 1 Chase National Bank, completed last February as a 58-bbl. pumper from perforations at 9,188-96 ft.

SOUTH LOUISIANA

New Deep-Sand Production At Lake Arthur Extended

Prolific gas-condensate production being developed by Union Sulphur & Oil Corp. in the deep Frio-Camerina sands at Lake Arthur, in Jefferson Davis Parish, is being extended 1¼ miles west-northwest.

The extension is by the company's 1 Broussard, being completed as the seventh consecutive producer in the deep zones, opened in 1953 and now stretching more than 4 miles from east to west along the southern sector of the original Lake Arthur field.

Completion is from casing-perforated interval at 10,909-32 ft., from which, in a preliminary drill-stem test through ⅛-in. top and ¼-in. bottom chokes, the well started making a heavy, although ungaged, flow of gas and condensate. Working pressure built up to 5,000 psi. Bottom-hole flowing pressure gaged 5,600 psi. Hole had been drilled to 13,450 ft.

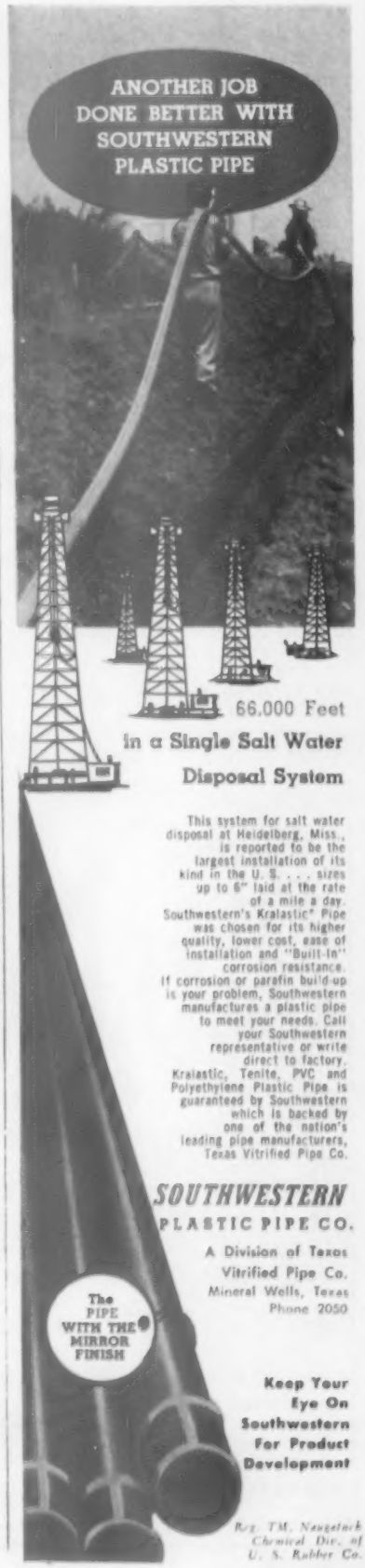
Nearest production is the company's 1-B Maple, completed late in November as confirmation of extension of the deep Camerina production to the southwest flank of the field. That well remains shut in following successful tests with pay interval at 11,901-81 ft.

Second Well Adds Pays In New Offshore Field

Magnolia Petroleum Co.'s second test in the West Cameron Block 110 area, 18 miles off the coast of Cameron Parish, has been completed as a gas-condensate producer in two sands, one perforated at 6,696-6,716 ft. and the other at 7,978-8,008 ft.

Bottom location is 1,320 ft. from the company's initial test and discovery well, completed last May with oil production from a deeper sand at 8,143-50 ft. Both wells were drilled from the same platform.

Flow of the second well through ¼-in. choke was gaged at 30 bbl. of 42°-gravity condensate and 3,750,000 cu.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ft. of gas per day with pressure of 2,504 psi. Open-flow potential was calculated at 31,000,000 cu. ft. of gas per day. Shut-in pressure is 3,042 psi.

South Pass Area Gets New Offshore Strike

Shell Oil Co. has a new offshore oil-discovery in the general area of the rapidly expanding South Pass Block 24 field, off the southeast tip of Plaquemines Parish.

Its 1-B State Lease 1008, in Block 24, produced at the rate of 225 bbl. of 32°-gravity oil on completion gage through 10/64-in. choke. Flow was with gas-oil ration of 622 cu. ft. per barrel and pressure of 1,030 psi. Pay interval is 7,400-10 ft. with total depth at 7,500 ft.

It opens a new reservoir, extending production and establishing a new pay zone.

MISSISSIPPI

New Deep Pay Indicated In Bolton Development

Opening of a new deep producing sand in Hinds County's Bolton field, 15 miles west of Jackson, is virtually assured by the recovery of 2,500 ft. of pipeline oil in a 12-minute drill-stem test of an interval at 10,503-47 ft. in Larco Drilling Co.'s northwest extension test, 1 Mashburn.

No formation water was indicated in the test, which recorded bottom-hole flowing pressure of 3,300 psi., and bottom-hole shut-in pressure of 4,775 psi. after 10 minutes.

The indicated well, drilled to 10,881 ft. and now starting completion tests with casing run to 10,600 ft., is a diagonal northwest offset to Larco's discovery well, 1 Lettie McAlpin, completed last July with production from a Lower Cretaceous-Paluxy sand. It was the state's first production from that horizon. Two additional Paluxy wells have been completed, a south offset and a west offset.

Sand in Larco's Mashburn well immediately overlies the deeper Ferry Lake anhydrite, which in turn overlies the potentially productive Glen Rose-Rodessa sands being tested with disappointing results, so far, by Magnolia Petroleum Co. in its 1 Cockrum, north offset to Larco's Paluxy discovery well, and east offset to Larco's new Mashburn well. The Mashburn well's sand was not present in Magnolia's well. Base of the anhydrite is reported to have been approximately 260 ft. lower in the Mashburn well than in Magnolia's.

Two dry holes have been drilled in the immediate area. These are Larco's 2 McAlpin, a location east of the discovery well, and Sun Oil Co.'s 1 Lancaster-Gaddis Unit, about ¾ mile south. In addition, Dick Quinn has given up at his 1 Mashburn, an extension attempt 1¾ miles north of production.

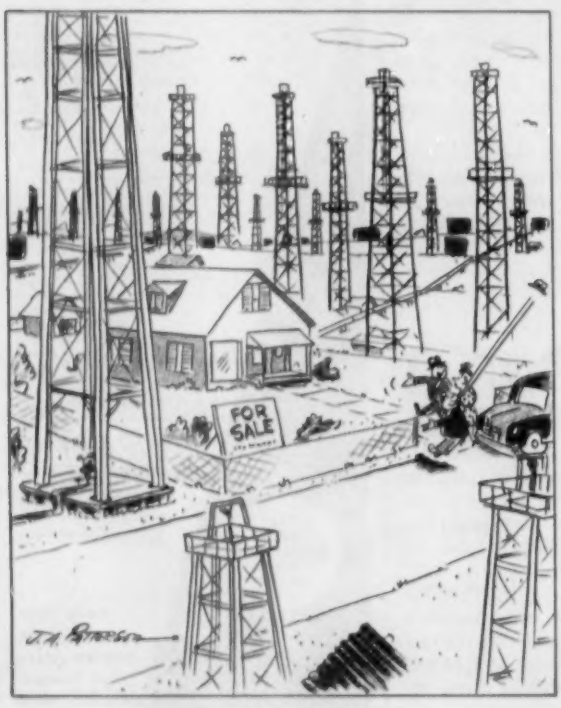
EASTERN INTERIOR

ILLINOIS

Production Passes 60,000,000 Bbl. for First 11 Months

Since January 1, 1954, Illinois has produced approximately 60,000,000 bbl. of oil with a value of more than $175,000,000, according to the State Geological Survey Division of the Department of Registration and Education. Illinois is producing more oil than any other state east of the Mississippi.

The November Drilling Report shows that two new oil pools were discovered during November, Cooks Mills East in Coles County and Elliottstown East in Effingham County. Two extensions were completed to Mt. Auburn Consolidated pool and one to Edinburg West pool in Christian County. There were also extensions to Decatur pool in Macon County and Mill Shoals pool in



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The chips that talk...

To the native savage, whose tribe had no conception of a written language, the piece of wood on which the explorer scribbled a message became the wonderful "chip that talks."

The chips of metal that pour in silver drifts from the mighty machines in Sun Ship's Wetherill plant tell their stories, too. Those shown on the 14-foot boring mill tell part of the story of a fast, thorough repair job on ship-propulsion machinery. That job required lifting a 54-ton section of crankshaft from the ship to a 10 ft. x 50 ft. engine lathe, where it was checked for trueness and the journals machined. The crankpins were machined in a huge crankshaft machine. The boring mill operation shown was the facing of the webs of a new section which replaced one of the damaged sections of the crankshaft.

That's the kind of story the versatile men and machines at Sun Ship have been writing for decades . . . in building special machinery of every type for the varied industries that are building a greater America.

Sun

SHIPBUILDING & DRY DOCK COMPANY

ON THE DELAWARE SINCE 1916 CHESTER, PA.

25 BROADWAY • NEW YORK CITY

Wayne County. The first Devonian well in Christopher Consolidated pool in Franklin County was completed in November, and also the first Paint Creek sandstone well in Carmi North pool in White County.

There were 289 wells drilled for oil and gas during November, making an 11-month total of 2,916, an increase of 943 wells over the number drilled during the first 11 months of 1953. The 289 wells include 168 oil wells and 1 gas well.

Christian and Macon counties continue as areas of active exploration and development. Nine oil wells were completed in the Mt. Auburn Consolidated pool and five in Edinburg West in November. The latter pool, less than 3 months old, now has 11 producing wells, one of which, completed in November, had an initial production of about 650 bbl. per day. In Macon County the Blackland, Decatur and Cakley pools also had new producing wells completed.

The annual supplement to the Drilling Report, containing lists of oil and gas pools in Illinois and tables showing production by pays and depths to tops of producing formations in all pools, will also be released December 10 to accompany the November Drilling Report.

PACIFIC COAST

CALIFORNIA

New Deeper Pay For Tejon - Grapevine

Drilling & Production Co.'s wildcat 1 mile west of the new Olcese pool at Tejon-Grapevine, southeast San Joaquin Valley, was successful in a deeper Jewett sand after earlier tests had indicated the Olcese sand was dry. On a 4-hour production test 495 bbl. of 38°-gravity crude were gaged through a 14/64-in. choke, with tubing pressures of 1,400 psi. Production was from the interval of 7,007-39 ft., some 1,100 ft. below the level of the 12-well Olcese pool.

In NE NE 27-11n-19w, ½-mile north of the nearest Olcese producer, Reserve Oil & Gas Co. 72-27 was nearing critical depths. Another wildcat being closely watched was that of Butler & Long in NW SW Section 27, ½ mile northwest of production. It was drilling below 8,200 ft.

Deep Fillmore Test Dry

Standard Oil Co. of California suspended its 1 Hardison Ranch 1½ miles west of the 14,000-ft. Sespe field it discovered near Fillmore early this year. On a formation test at 14,191 ft. salt water reportedly was recovered. Hole then was carried to 15,630 ft., at which depth operations were suspended. Location of the Ventura County test is in SE NE 27-4n-20w.

New Gas Field Near Shafter

Tide Water Associated Oil Co. scored a new gas discovery at its wildcat, 63-18 Loepp, about 2 miles west of Shafter, Kern County. With 5½-in. combination string landed at 4,315 ft., the interval 4,295-4,305 ft. yielded dry gas at a 5,500 M.c.f. daily rate during a 1-hour test. Flow was through a ½-in choke, with a tubing pressure of 1,020 psi. Location of the discovery is in SW NE 18-28s-25e, about ½ mile south of a 12,618-ft. dry hole drilled by Tide Water several years ago.

Deep Ventura Well Testing

Lloyd Corp., Ltd., was preparing to test oil shows in its deep wildcat on the eastern edge of the Ventura Avenue field. Previously it had run 5½-in. liner to 16,492 ft. Establishing a new depth-record for the field, 1 William Sexton, in 20-3n-22w, had been deepened from 13,058 ft.

WASHINGTON

New Washington Wildcat

Continental Oil Co. was preparing to spud 1 G. Hogan in Grays Harbor County, Washington, after having abandoned 1 J. B. Erkenbrecher at 1,005 ft. The new test, sixth for Continental in the current program, is in 22-16n-8w, or about 2½ miles east of the most recent dry hole.

ARIZONA

Wildcat Dry

The first of three wildcats planned for the Yuma area of southwest Arizona ended in failure. Colorado Basin Associates, Inc. 1 Newcomer & Pasquinelli, in 19-9s-23w, was abandoned at 3,800 ft.

GREAT LAKES

MICHIGAN

Best Strike of Year Flows Traverse Oil

Flowing oil from the Traverse at a rate of 6 bbl. of oil an hour, through a restricted choke, and after a 500-gal. acidization, the James J. McGerry, Trustee, 1 Cook, NE NE NW 7-11n-11w, Ensley Township wildcat, Newaygo County, appeared to have been confirmed as the most important basin and west state area discovery this year, perhaps in many years.

Wildcat flowed an average of 25 bbl. of oil a day natural. This new strike is located about 2½ miles south of Croton Traverse oil pool. There never was a completion in Croton pool which showed anywhere near the potential that this new wildcat is demonstrating.

WESTERN CANADA

ALBERTA

Alberta Recorded Five Strikes During Past Week

Alberta accounted for all five discovies chalked up in western Canada during the past week. Two of these yielded oil, while the remainder were gas discoveries, with one of these wells also giving up a small amount of light-gravity oil.

Two of the strikes were recorded in the Cardium sand, one in the Viking, one in the basal quartz while the other was made in the glauconitic sand.

Pigeon Lake-Bonnie Glen area . . . One of the Cardium strikes was made in the Pigeon Lake-Bonnie Glen area, where previously only D3 Devonian oil production was prevalent. This well, Texaco 7-26 Pigeon Lake, LSD 7, 26-46-28w4, about 40 miles southwest of Edmonton, is being drilled by Texaco Exploration Co.

The other Cardium discovery, 3 Cuba Harish, LSD 3, 12-5-27w4, located on the west fringe of the famed Leduc-Woodbend field, was drilled as a Cardium test. The venture was drilled by Charles Ulrich Bay & Associates of Denver. Gas was indicated on drill-stem test at 2,978-3,005 ft. Gas reached the surface immediately at the maximum rate of 3,000 M.c.f. per day. The well has been capped as a potential Cardium sand gas well.

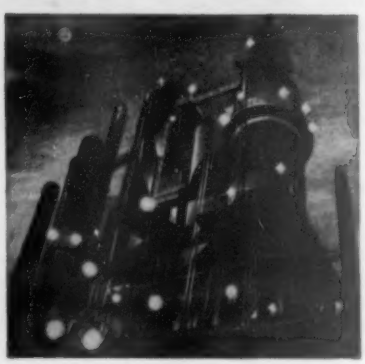
Grassy Island Lake . . . A Viking oil discovery was made in this area by the California Standard Co. at 10 Grassy Island Lake, LSD 6, 11-35-7w4, 11½ miles east of Viking oil production at Hamilton Lake.

Glauconite discovery . . . The well that became a Glauconitic sand discovery is being drilled by a group consisting of Seaboard, Honolulu, Sunray, and Los Nietos.

This well, Seaboard-Western Minerals 2-21 Bruderheim, LSD 2, 21-55-20w4, flowed gas at the estimated rate of 1,000

(Continued on page 177)

Night-light time



WHILE MOST OF the world sleeps, Anglo-Iranian's refineries and distribution organisation are working for the benefit of mankind.

The child's night-light is a small example. The world demand for energy has doubled in the last twenty years and oil supplies two thirds of this.

Anglo-Iranian makes an impressive contribution. Last year production averaged over 640,000 barrels of oil a day. There are refineries in eight countries and one of the world's largest privately-owned tanker fleets to carry the oil. The company's marketing organisation stretches from Iceland to Tasmania.

Half a century of enterprise and continuous progress have put Anglo-Iranian among the world's largest and most progressive oil companies.

THE BP SHIELD IS THE SYMBOL OF THE WORLD-WIDE ORGANISATION OF

Anglo-Iranian Oil Company
LIMITED

PERSONALS

New Director Named

Depression helped Cash find job in oil business

JOBS were scarce in 1933 when Harvey Cash received his B.S. degree in electrical engineering from Texas A. & M. College. Although he had prepared for a career in radio, young Cash took the first job he could find, which happened to be with The Texas Co.

His depression-inspired expediency paid off. Now, at 44, Cash is general manager of foreign operations in the Eastern Hemisphere for Texaco and a newly elected director of California Texas Oil Co., Ltd.

Radio was a promising young industry when Cash set his sights on a degree in electrical engineering. But he soon found the oil industry was in need of the same type of skills. Electrical engineers were in demand for seismic exploration, then in the experimental stage as a potential aid in finding oil.

Cash was assigned to the third seismographic party ever put in the field by The Texas Co. He quickly advanced from assistant recorder in the company's geophysical division to an office job as seismograph interpreter and later to party chief.

War service . . . His career with Texaco was interrupted by World War II, but Cash was able to put his specialized knowledge to valuable service in the Army.

Assigned to the staff of the Army's chief signal officer in Washington, Cash helped develop new sound-ranging equipment to replace antiquated devices used by the military in World War I. One of his assignments was to coordinate research work on seismic equipment at colleges throughout the United States. Later, he was given the task of streamlining distribution of materiel from factories to the armed forces.

Cash was discharged from the Army with the rank of lieutenant colonel in February 1946, after 4 years of military duty. He was awarded the Legion of Merit for his wartime service.

Promotions . . . Putting away his silver oak leaf, Cash returned to the banner of the red star and green T as supervisor of field operations in Texaco's geophysical division at Houston. A series of quick promotions soon followed, climaxed by his recent election to the Caltex board of directors.

In January 1948 he was assigned to the South Texas division. A year later, he was named assistant to the divisional manager in the producing department at Tulsa.

Cash was promoted to assistant manager of foreign operations in the Eastern Hemisphere in March 1953 and moved on up to his present job as general manager shortly thereafter.

Small-town boy . . . Cash was born in 1910 at Dimmitt, Tex., a small town which claimed a population of about 75 people until 1920 when the Cash family moved away. With the migration of his family, Cash claims, the community's population shrank by 10 per cent.

Cash grew up in the cattle-and-wheat country around Canyon, in the Texas Panhandle. He worked on a farm as a boy, but never got used to wheat chaff drifting down the collar of his shirt. His dissatisfaction on the farm led to his decision to get a college education—a prerequisite in fulfilling his dreams of a soft life as a radio engineer. Instead, his education led to long work hours rivaling those of any wheat farmer.

Cash is married to fellow-displaced Texan, Mary Berryman, formerly of Kemp, a small community southeast of Dallas. They have one child, Berry.

The new Caltex director is an amateur photographer of considerable renown and a persevering golfer, who describes his own game as "lousy." He hopes to correct the latter situation, incidentally, if he ever finds the necessary time.

Bill Sandeen, geologist with Standard Oil Co. of Texas, has been transferred from El Paso to Lubbock, Tex.

L. Kelley Turner, party chief with Continental Oil Co., has been transferred from Sebring, Fla., to Garden City, Kans.

W. Floyd Wright, former exploration geologist for Standard Oil Co. of Texas at Lubbock, Tex., has resigned to become an independent oil and uranium geologist at Lubbock.

L. D. Alford, W. T. Hazelwood, J. E. Rinehart, Jr., and **H. L. Smith** have been promoted to shift foremen at Dow Chemical Co.'s Dow Texas Division ammonia department.

David D. Dyche has been promoted to traffic representative by Continental Oil Co. at its central region at Oklahoma City. Dyche has been with Conoco since 1946.

A. B. O'Brien has been promoted to senior mechanical engineer in the design department of the engineering division of the Baytown, Tex., refinery by Humble Oil & Refining Co.

John H. Harstine has joined Skelly Oil Co. as an engineer at Pawhuska, Okla. Harstine was a research engineer with Stanolind Oil & Gas Co. at Tulsa before joining Skelly.

Sydney T. Ellis has been named executive vice president of Commercial Solvents Corp. Ellis, who has been a member of the board of directors since 1953, had been serving as administrative vice president.

H. E. Von Rosenberg, B. R. Dickey, C. L. Umboltz, and **M. G. Whitcomb, Jr.,** have joined Humble Oil & Refining Co. at its Baytown, Tex., refinery. Von Rosenberg has been assigned to the research and development division. Dickey, Umboltz, and Whitcomb have been assigned to the technical-service division.

Fred E. (Sam) Stickle, president of Stickle Drilling Co., Great Bend, Kans., has been elected president of the Kansas Independent Oil and Gas Association. He succeeds **George Bruce,** of the Aladdin Petroleum Corp., Wichita. Other officers elected are: **Tom Orr,** Wichita, reelected executive secretary; **Harold D. Dufek,** Dufek Oil Well Service, Inc., Hutchinson, treasurer; and **W. R. Murfin,** Murfin Drilling Co., Wichita, secretary. Vice presidents and their districts include: **J. C. Lemon,** south-central Kansas; **J. E. Morris,** east central; **Carl Weiner,** eastern; **Don**

PERSONALS

Skinner, southwestern; **Glen Nye,** northwestern; and **Bob Mallonee,** Sedgwick County.

Lyle D. Simpson has joined El Dorado Refining Co., El Dorado, Kans., as a field representative for the Des Moines area.

Guy Willis, of Pan American Production Co., Midland, Tex., has been elected president of the Permian Basin Crude Oil Representatives Association. Other new officers are **W. D. Kleine,** Phillips Petroleum Co., vice president; **John A. Mills,** The Texas Co., secretary-editor; and **W. T. Shirey,** Sinclair Crude Oil Co., treasurer.

Clifford W. Trice has resigned as president and general manager of Trans-Tex Drilling Co., of Longview, Tex., to form Trice Production Co. Before joining Trans-Tex, Trice served with H. L. Hunt Co. as chief engineer. Other officers of Trice Production are **James L. Pardue,** vice president and general counsel; **Joe Upton,** treasurer; and **Gwen M. Farmer,** secretary.

George S. Buchanan, vice president in charge of land and exploration for Husky Oil Co., has been named president of Trans-Tex Drilling Co. Husky, which owned 95 per cent of Trans-Tex, recently bought the remaining 5 per cent from **Clifford W. Trice.** Other newly elected officers are **M. R. McArthur,** vice president; **J. C. Gilbert,** vice president and acting general manager; and **R. F. Cowley,** secretary and treasurer.

Vaughn W. Russom, senior field geologist for Sinclair Oil & Gas Co., has been transferred from Bismarck, N. D., to Tulsa.

George P. Bunn, manager of the natural-gas and natural-gasoline department of Phillips Petroleum Co., has been appointed to the executive committee of the National Council for LP-Gas Promotion. Bunn will also continue to serve as vice president of the council, representing the National Gasoline Association of America.

Eldon Valden Hunt has been appointed chief engineer of Alberta Gas Trunk Line Co., Ltd., the provincial gas-gathering system for Trans-Canada Pipe Lines, Ltd. Hunt began his pipeline career in 1928 as an engineer with Colorado Interstate Gas Co. He resigned in 1940 to join the Army, and since his discharge he has served as an engineer with Michigan Wisconsin Pipe Line Co. and Transcontinental Gas Pipe Line Corp. In 1953 he joined Ebasco Services, Inc., and later managed Key City Gas Co. in Dubuque, Iowa.

A. L. Carpenter, with Humble Oil & Refining Co. in Odessa, Tex., has been elected chairman of the Permian basin section of the American Institute of Mining and Metallurgical Engineers for 1955. Carpenter replaces **J. R. Brack,** with Forest Oil Corp. in Midland, Tex. Other new chapter officers are **R. M. (Bob) Leibrock,** district engineer for Stanolind Oil & Gas Co. in Midland, vice chairman; **Gene Scheilcutt,** with Lane-Wells Co. in Odessa, vice chairman; and **Maynard Russell,** with Dowell Incorporated, at Midland, secretary-treasurer.

Stephen L. Tyler, who has been secretary and executive secretary of the American Institute of Chemical Engineers for 17 years, will retire on December 31. He will be succeeded by **F. J. Van Antwerpen,** who has been with A.I.Ch.E. since 1946 as editor of its magazine "Chemical Engineering Progress." During Tyler's service, the society has grown in membership from 1,486 to 14,500 members.

George C. Gaines, general superintendent of Tide Water Associated Oil Co.'s Bayonne, N. J., refinery, has been named to direct development of a new refinery to be built by Tide Water somewhere along the eastern seaboard. The company announced plans to abandon its Bayonne plant several months ago.

Leo W. Abel, former junior exploitation engineer at Los Angeles for Shell Oil Co., has been promoted to mechanical engineer and transferred to Bakersfield, Calif. Other changes made by Shell include **Stanley A. Beck,** exploitation engineer, transferred from Long Beach to Ventura, Calif.; **Sergio E. Rodriguez,** exploitation engineer at Long Beach, transferred to Los Angeles; and **Eugene Q. Schaeffer,** promoted from junior mechanical engineer at Los Angeles to mechanical engineer at Bakersfield.

Independents Meet to Discuss Measures against Imports

One of the largest shows of independent strength was seen at the speakers table in the Texas Hotel at Fort Worth last week as anti-imports meeting got under way. Shown from left to right are Lawrence Hagy, Panhandle Producers and Royalty Owners Association; Jack Woodward, Texas Independent Producers and Royalty Owners Association; W. M. Vaughey, Independent Producers of America Association; Bryan Payne, TIPRO; Roy Stewart, I.P.A.A.; E. C. McCurdy, Jr., East Texas Oil Association; D. C. Norwood, North Texas Oil and Gas Association; and P. W. Pitzer, Jr., West Central Texas Oil and Gas Association. Payne and Stewart, chairman of the TIPRO and I.P.A.A. import-policy committees, respectively, were cochairmen of the Fort Worth meeting.

PERSONALS

W. C. Krafve, geologist with Magnolia Petroleum Co. for the past 6 years, has resigned to open offices as a consulting geologist in San Antonio.

N. H. GELLERT

N. Henry Gellert, who led the successful effort to bring natural gas to the Pacific Northwest, has resigned as president of Seattle Gas Co., effective March 15, 1955. Gellert, who is the company's largest individual stockholder, will act as a consultant to the firm. Before joining Seattle Gas in 1941, Gellert did utility consulting work, and at one time managed 30 gas, water, and electric companies. **Walter Byrne,** now a member of the board of directors of Seattle Gas, will succeed Gellert as president. **Charles M. Sturkey** will continue as general manager and will advance to executive vice president.

J. P. Holland, junior petroleum engineer with Humble Oil & Refining Co., has been promoted to associate petroleum engineer in the Flour Bluff district of the Southwest Texas division. **Norman Newsome,** senior petroleum engineer, Gulf Coast division office, has been transferred to the Hardin, Tex., district as district petroleum engineer, replacing **B. W. Moller,** who resigned.

Bert Crowder, Humble Oil & Refining Co., has been elected president of the East Texas Chapter of American Petroleum Institute. Other officers elected are **Milner Reed,** vice chairman for programs; **John Wylie,** R. M. Bass Drilling Co., vice president for membership; **J. C. Farris,** Stanolind Oil & Gas Co., vice president for entertainment; **Jim Foster,** Sun Oil Co., vice president for finance; and **Sam Cox,** East Texas Engineering Association, renamed secretary-treasurer.

Marvin L. Brown and **Lloyd E. Miller** have been promoted to assistant division managers of the Canadian production division of Sun Oil Co. Brown was named assistant division manager of the operating department and will continue also to serve as superintendent of the operating department. Miller, former division chief geologist, was promoted to assistant division manager of exploration. He will continue to carry out the duties of division chief geologist. Brown moved to Canada in 1951 as production superintendent at Calgary from Dallas, where he was regional superintendent of production in the southwest division. Miller was a member of the Sun production department's geological advisory staff in Philadelphia until he was moved to Canada as division chief geologist in April 1950.

R. E. Lauth, geologist with Witco Oil & Gas Co., has been transferred to the company's newly formed Denver offices from Amarillo, Tex.

Graham B. Moody, chief reserve engineer on the executive staff of Standard Oil Co. of California, has retired after 34 years of service with Standard of California. Moody served with the company in the Philippines, Mexico, and a major portion of the southwestern United States. He was named senior reserves engineer in 1944 and chief reserves engineer in 1951.

Irving Dagan, petroleum engineer for Standard Oil Co. of California, has been elected chairman of the Coalinga-Kettleman Hills Chapter of American Petroleum Institute. Other officers are **O. M. Giffin,** Sunray Oil Corp., first vice chairman; **Ralph Nabors,** Pacific Gas & Electric Co., second vice chairman; and **Robert Lydon,** engineer for P. S. Magruder, Operator, secretary-treasurer.

P. L. Kartzke, Shell Oil Co., has been elected chairman of the board of governors of the Canadian Petroleum Association for 1955. He succeeds **W. D. C. MacKenzie,** Imperial Oil, Ltd. **Charles Hay,** Royalite-Hi-Way Co., and **E. H. Vallat,** Triad Oil Co., Ltd., were elected vice chairmen of the board of governors. MacKenzie; **C. Daniels,** Royalite Oil Co.; **G. Knox,** Standard Oil Co. of California; and **H. R. Moorman,** Socony-Vacuum Oil Co., Inc., were named to the executive committee.

Harry Hillman, California Production Service Co., has been appointed chairman of the safety committee of the California Chapter of American Association of Oil Well Drilling Contractors for the 1954-55 fiscal year. Other appointments announced by **Stanwood I. Williams,** president of Thomas P. Pike Drilling Co. and chairman of the chapter, were **W. D. (Bill) Tetsch,** Terminal Drilling Co., programing; **Harry Buchanan,** Bell & Burden, Inc., membership; **Mitchell Erwin,** Dunlap & Graham, education; and **J. P. Tolton,** Thomas Pike Drilling, insurance and taxation.

O. Carrell Blair, former field petroleum engineer with Gulf Refining Co., Daisetta, Tex., has been transferred to Shreveport as a petroleum reservoir engineer.

Dr. Clifford S. Lord has been appointed chief geologist of the Geological Survey of Canada. He succeeds **Dr. George Hanson,** who became director of the survey in October 1953.

Seaborn L. Digby, member of the Federal Power Commission, has been elected by members of the commission to serve as vice chairman during 1955. Digby, a democrat, was nominated for the FPC by President Eisenhower in July of 1953 and took office in August of that year. He was formerly Commissioner of Conservation in Louisiana.

DEATHS

Robert Walter Miller, 58, vice president and director of Creole Petroleum Corp., died in London, England, December 10 in London Clinic after an operation. Miller was first employed by Creole's parent firm, Standard Oil Co. (N.J.), in 1919 as a clerk in the Bayway, N. J., refinery. He worked for Jersey until July 1944 when he was transferred to Creole as export sales manager. He was elected a vice president of the company in 1947 and a director in 1948.

Roger W. Williams, 42, economic coordinator for Standard-Vacuum Oil Co. in Palembang, Sumatra, died December 11, after a brief illness. He joined Esso Standard Oil Co. at Bayway, N. J., in 1934 and in 1950 was given a year's leave of absence to work with the Government on a petroleum program in connection with the Korean War. He had arrived in Sumatra November 3, for a 3-year stay.

W. O. McConnell, 47, Farmington, N. M., pioneer in development of the San Juan basin, died recently at Phoenix, Ariz., of a heart ailment. He formed McConnell, Inc., in 1954 after he had served since 1947 with two other operators in the McConnell Drilling Co.

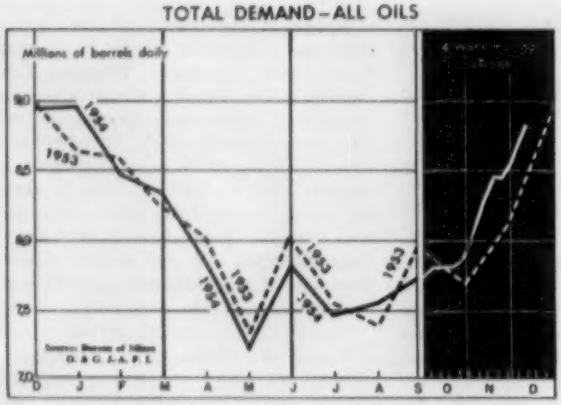
Robert H. Lightfoot, 56, Dallas independent with oil holdings in Texas, Louisiana, Oklahoma, and Mexico, died December 12, in Dallas. Lightfoot operated Pan American Oil Co. in Tampico, Mexico.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,330,400	UP	11,075	UP	81,809
Crude stocks	267,339,000	DOWN	530,000	DOWN	13,189,000
Completions	1,177	UP	64	UP	71
Refinery runs	7,105,000	UP	143,000	UP	190,000
Gasoline stocks	150,653,000	DOWN	725,000	UP	259,000
Four-product stocks	361,733,000	DOWN	10,862,000	UP	1,069,000
Total imports	1,097,400	DOWN	94,100	UP	1,400

TOTAL DEMAND – ALL OILS



Strength of Refined-Products Market Centered in Heating Oil

REFINERS on the Gulf Coast and in the Mid-Continent have a smaller spread between crude cost and product realization than in the period before the last crude-price increase.

Most of this drop in spread has been due to the continuing soft market for gasoline. Colder weather in the fourth quarter has produced better markets for both light and heavy fuels, but the gains have not been large enough to offset low gasoline prices.

East Coast gains . . . Kerosine and distillate fuels moved up 0.6 cent a gallon in the New York area early in the month with varying increases for other areas on the East Coast. Since part of the gain was due to higher tanker rates, the increase was not reflected fully in the Gulf Coast market.

The new price brings the low quotation for kerosine up to 10.7 cents per gallon for barge delivery in New York Harbor. This compares with 10.25 cents on the corresponding date last year and 10.5 cents in 1952. The low quotation in New York Harbor in early December 1951 was 10 cents a gallon. Note that kerosine prices before the latest increase were about the same as in 1951. Crude has increased 25 cents a barrel or about 0.6 cent a gallon since that time.

No. 2 distillate has increased only slightly more than kerosine in the past 3 years. The new barge price for No. 2 fuel in New York Harbor is 9.95 cents a gallon compared with 9.25 cents in 1953, 9.65 cents in 1952, and 9.0 cents in 1951.

Quotations for barge delivery of unbranded regular gasoline in New York Harbor are lower now than corresponding quotations for the past 3 years.

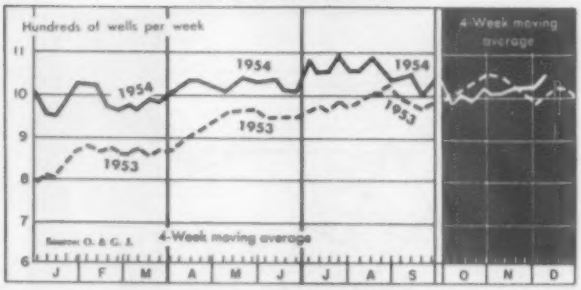
Residual fuel in New York Harbor increased 10 cents a barrel to $2.35 early in the month, due to the sharp increase in tanker rates. However, the general market tone has shifted in the past month. Late in November there were reports of some discounting in the area, indicating a low in the harbor of about $2.20 a barrel. Very little spot material is now available for movement from the Gulf Coast to the East Coast. More of the Gulf Coast suppliers have shifted from the low of $1.85 a barrel to $1.95.

Mid-Continent trends . . . Colder weather in the North Central States combined with good post-season demand for gasoline in most of the Mississippi valley area has tightened Group 3 products markets.

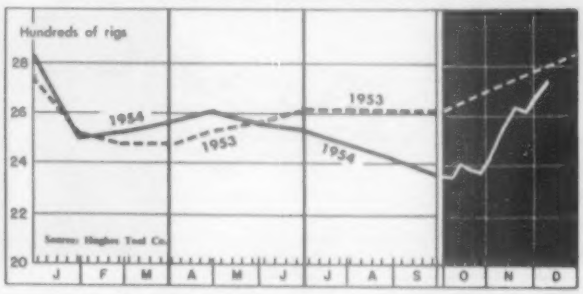
Gasoline that has been available from pipeline terminals at prices as low as 10 cents a gallon plus pipeline charges from Group 3 refineries has moved up to about 10.375 cents plus transportation charges, or about the same as the 1952 price.

Part of the increase for gasoline can be credited to the shortage of gasoline at pipeline terminals in the last half of November. Mid-Continent refiners filled pipelines with distillate to meet early winter demands and were caught with low gasoline stocks and good gasoline demand.

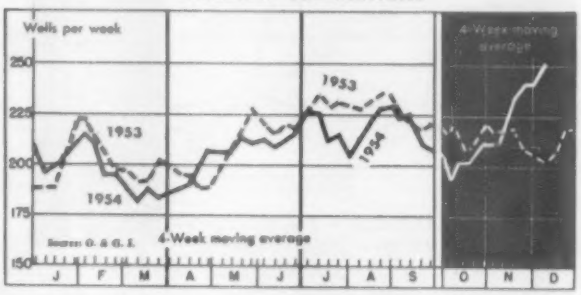
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS

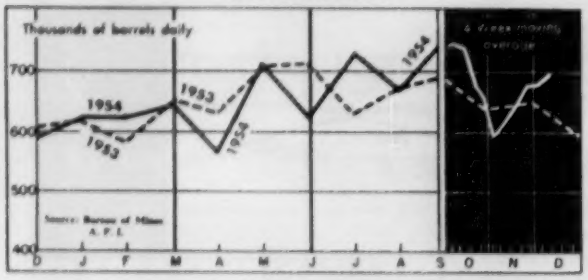
Area—	12-13-54	Change from 12-6-54	Change from 12-14-53
Gulf Coast	577	12	— 30
N. and W. Texas-New Mexico	893	42	15
Arkansas-N. Louisiana-E. Texas	200	8	— 10
Oklahoma	332	7	— 77
Kansas-S. Nebraska	190		17
Illinois-Eastern	148	— 2	— 22
Rocky Mountain	249	—13	— 49
Pacific Coast	149	6	— 26
Total United States	2,738	60	—182
Western Canada	212		— 53

WEEKLY WELL COMPLETIONS . . . WEEK ENDED DECEMBER 11, 1954

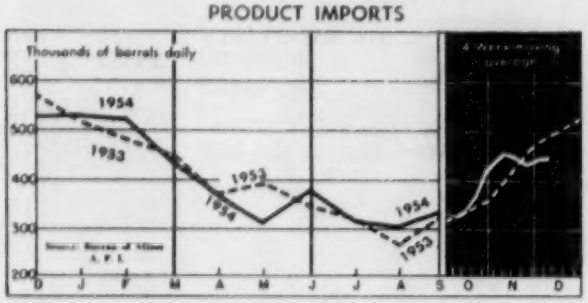
	Total of all wells: Comp.	Oil	Gas	Dry	Footage	Cum. 1954	Cum. 1953	Wildcat completions and discoveries: Oil	Dist.	Gas	Dry	Total	Cumulative total, 1954: Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	0	0	0	0	0	96	136	0	0	0	0	0	2	0	2	83	87
Arkansas	8	5	1	2	34,913	604	554	0	0	1	0	1	23	0	5	113	141
California	51	36	0	15	224,033	2,238	2,420	1	0	0	10	11	56	1	13	487	557
Colorado	57	15	3	39	272,791	1,279	696	3	0	2	20	25	38	0	19	536	593
Illinois	73	49	1	23	183,063	2,962	2,074	1	0	0	5	6	26	0	1	409	436
Indiana	13	5	0	8	21,548	809	1,266	0	0	0	2	2	9	0	1	195	205
Kansas	98	52	6	40	347,340	4,354	4,564	12	0	0	18	30	130	0	33	585	748
Kentucky	20	7	0	13	28,196	1,100	1,115	0	0	0	4	4	18	0	4	132	154
Louisiana	109	82	6	21	597,686	3,378	2,759	5	1	2	8	16	101	52	45	349	547
North	72	54	3	15	223,809	1,873	1,238	2	0	1	6	9	19	3	17	158	197
South	37	28	3	6	373,877	1,505	1,521	3	1	1	2	7	82	49	28	191	350
Michigan	15	5	0	10	45,346	542	589	2	0	0	8	10	17	0	0	206	223
Mississippi	11	4	0	7	77,845	412	381	0	0	0	1	1	10	1	0	151	162
Montana	6	4	1	1	20,092	319	432	0	0	1	2	3	6	0	3	108	117
Nebraska	18	6	0	12	103,570	419	306	1	0	0	10	11	24	0	3	135	162
New Mexico	29	8	14	7	168,610	1,044	1,366	0	0	0	5	5	22	3	20	104	149
Northwest	15	0	13	2	84,365	360	601	0	0	0	1	1	4	0	18	44	66
Southeast	14	8	1	5	84,245	684	765	0	0	0	4	4	18	3	2	60	83
North Dakota	12	4	0	8	75,424	296	254	0	0	0	6	6	5	0	0	110	115
Ohio	24	11	5	*8	51,811	1,108	1,053	0	0	0	0	0	3	0	5	14	22
Oklahoma	187	119	9	†59	581,467	8,392	7,172	17	0	0	14	31	138	7	23	635	803
Pennsylvania-New York	28	9	9	‡10	46,037	2,083	2,156	0	0	0	0	0	0	0	7	36	43
Texas	388	246	13	129	1,702,452	17,564	16,294	8	0	1	75	84	731	66	156	3,923	4,876
Southwest (1 & 4)	58	30	1	27	228,750	2,466	2,629	2	0	1	18	21	102	26	43	686	857
Gulf Coast (2 & 3)	56	24	2	30	367,512	2,508	2,423	2	0	0	19	21	78	32	44	637	791
East (5 & 6)	22	9	3	10	129,304	944	768	0	0	0	6	6	17	0	14	277	308
North Central (7-B & 9)	130	85	0	45	364,085	6,643	6,187	3	0	0	21	24	338	4	22	1,586	1,950
West (7-C & 8)	104	89	2	13	555,046	4,091	3,563	1	0	0	10	11	190	1	24	661	876
Panhandle (10)	18	9	5	4	57,755	912	724	0	0	0	1	1	6	3	9	76	94
Utah	5	1	0	4	18,832	82	70	1	0	0	3	4	4	0	1	51	56
West Virginia	9	0	4	5	32,004	577	579	0	0	1	1	2	0	0	33	17	50
Wyoming	14	3	3	8	73,199	1,173	822	1	0	2	5	8	37	0	9	190	236
Miscellaneous (Ariz., Nev.)	2	0	1	1	11,895	116	74	0	0	1	1	2	3	0	2	37	42
Total United States	**1,177**	671	76	430	4,718,154	50,947	47,132	52	1	11	198	**262**	1,403	130	385	8,606	10,524
Total previous week	1,013	576	75	362	4,035,427			34	1	7	168	210	1,351	129	374	8,408	10,262
Total December 12, 1953	1,106	602	74	430	4,353,572			34	4	4	173	215	1,365	105	340	8,711	10,521

Service wells included: *4, †16, ‡7.

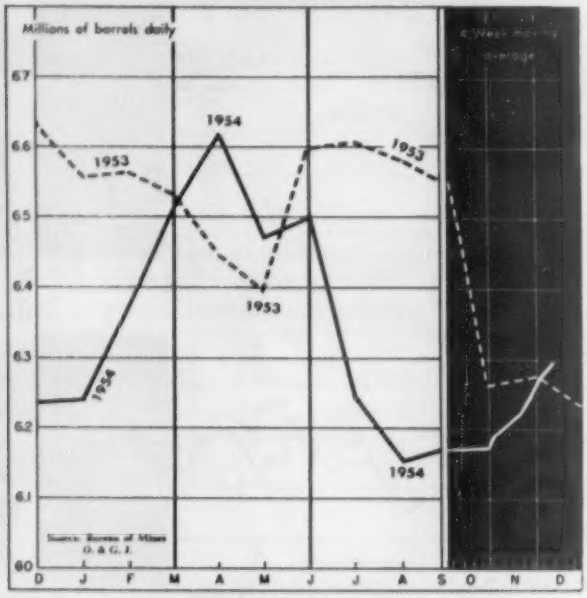
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

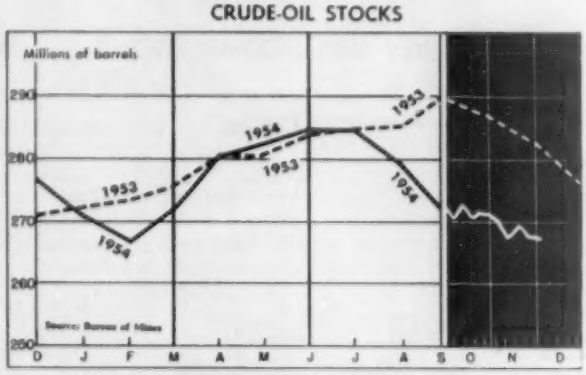


DAILY AVERAGE PRODUCTION FOR WEEK

	December 11			Dec. 4
	Crude oil	Lease condensate	Total	total
Alabama	3,900		3,900	4,000
Arkansas	72,050	450	72,500	72,850
California	960,000		960,000	960,000
Colorado	136,600		136,600	142,800
Eastern	49,800		49,800	49,800
Florida	1,400		1,400	1,400
Illinois	192,300		192,300	190,900
Indiana	28,200		28,200	29,900
Kansas	321,500		321,500	318,100
Kentucky	38,900		38,900	39,300
Louisiana	597,800	48,500	646,300	637,675
North	101,800	3,000	104,800	104,950
South	496,000	45,500	541,500	532,725
Michigan	31,200		31,200	33,400
Mississippi	89,500	3,800	93,300	93,125
Montana	39,100		39,100	39,900
Nebraska	21,700		21,700	21,600
New Mexico	212,350	2,550	214,900	212,675
North Dakota	19,800		19,800	19,100
Oklahoma	493,500		493,500	475,200
Texas	2,654,700	53,000	2,707,700	2,720,900
Dist. 1	46,000	475	46,475	45,175
Dist. 2	137,100	8,200	145,300	183,050
Dist. 3	416,000	25,000	441,000	436,675
Dist. 4	234,000	6,125	240,125	237,075
Dist. 5	43,000	500	43,500	43,475
Dist. 6	114,000	5,500	119,500	117,175
East Texas field	216,100		216,100	213,700
Dist. 7-B	129,500	25	129,525	129,300
Dist. 7-C	175,000	4,550	179,550	178,300
Dist. 8	868,000	1,975	869,975	861,450
Dist. 9	192,000	625	192,625	191,475
Dist. 10	84,000	25	84,025	84,050
Utah	4,700		4,700	4,500
Wyoming	252,800		252,800	251,800
Others	‡300		‡300	400
Total U. S.	6,222,100	108,300	**6,330,400**	6,319,325
Change from previous week, up			**11,075**	
Canada	†247,575		†247,575	†251,100
Total U. S. production January 1-December 11			2,182,720,775 bbl.	
Same period last year (crude plus cond.)			*2,234,767,188 bbl.	

*Includes 31,307,600 bbl. condensate. †Week ended previous Monday. ‡S. D. 100, Nev. 200.

CRUDE-OIL STOCKS



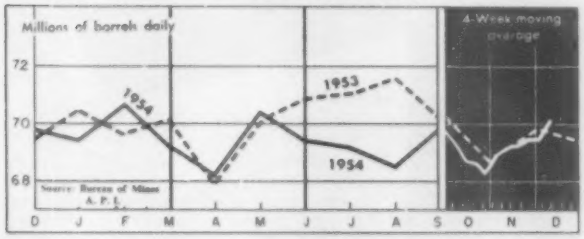
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

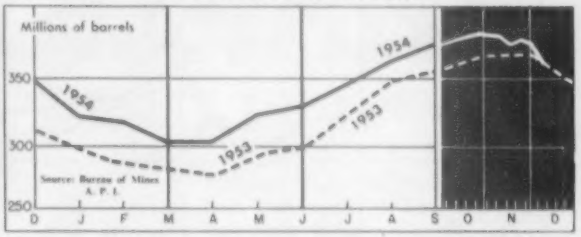
	Dec. 4, '54	Nov. 27, '54	Dec. 5, '53
Pennsylvania Grade	3,120	3,130	2,696
Other Appalachian	1,835	1,857	1,979
Illinois, Indiana, Michigan	12,021	12,584	12,651
Nebraska, North Dakota	1,658	1,855	(‡)
Kansas	8,341	8,244	8,797
Oklahoma	26,083	26,103	27,988
Arkansas	3,223	3,039	3,364
Louisiana	15,482	15,343	17,207
North	2,436	2,276	3,126
South	13,046	13,067	14,081
Mississippi	2,962	3,105	3,231
New Mexico	8,601	8,348	8,461
Texas	121,230	121,761	132,182
East Texas proper	9,878	9,786	11,531
West Texas	53,168	54,052	57,441
Texas Gulf	24,338	24,292	28,248
Other Texas	33,846	33,631	34,962
Wyoming	13,309	13,327	13,663
Other Rocky Mountain	5,996	6,251	3,260
California	31,730	31,257	33,584
Foreign	†11,748	11,665	11,465
Total	267,339	267,869	280,528

*Bureau of Mines. †Includes 3,352,000 bbl. in California. ‡Included with Kansas.

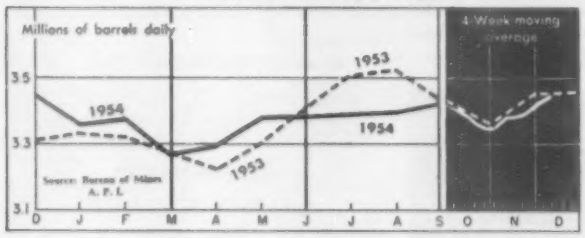
REFINERY RUNS



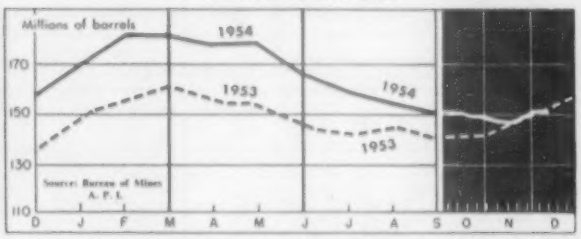
FOUR-PRODUCT STOCKS



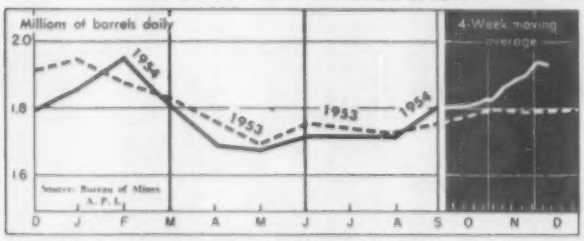
GASOLINE PRODUCTION



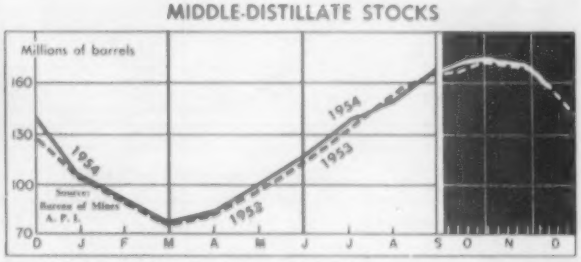
GASOLINE STOCKS



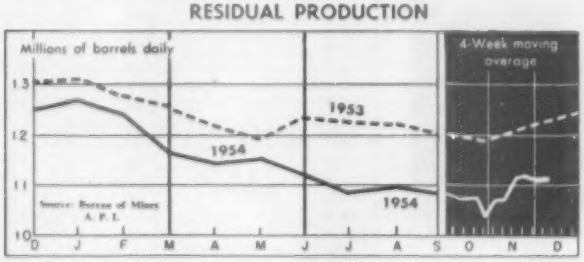
MIDDLE-DISTILLATE PRODUCTION



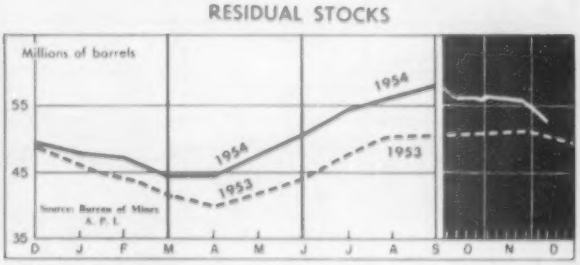
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, DECEMBER 10

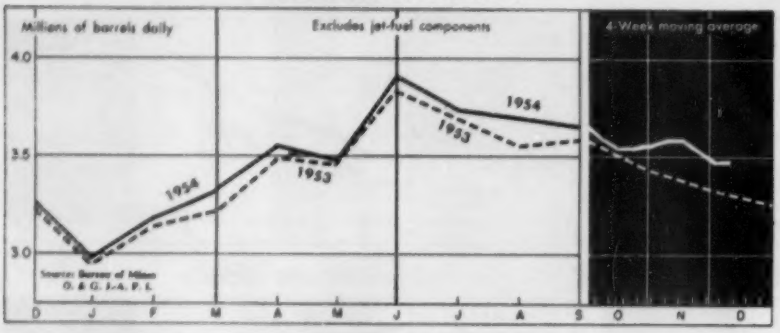
(Excludes all jet-fuel components)

(Thousands of barrels)

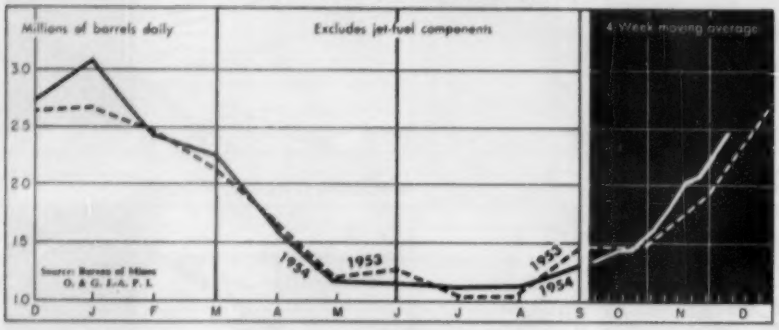
District—	Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, December 1953 — Daily avg. runs	Daily average production Gaso.*	Kero.	Dist.	Resid.
East Coast	1,040	455.3	53.7	244.6	234.3	32,951	12,877	45,483	8,959	1,018	446.4	44.3	232.9	227.1
Appalachian:														
District 1	93	37.4	7.7	17.0	5.6	4,406	556	2,438	566	118	50.6	6.0	25.7	13.1
District 2	77	34.9	6.0	15.7	6.7	2,434	554	761	256	81	44.7	5.7	15.7	11.1
Ind., Ill., Ky.	1,288	707.4	59.9	257.0	181.5	31,314	8,656	23,148	3,851	1,314	719.6	86.6	233.2	199.5
Okla., Kans., Mo.	637	349.4	25.0	147.0	47.1	13,564	2,261	12,509	1,380	572	353.4	11.1	124.3	48.7
Inland Texas	215	181.3	9.4	46.9	22.6	5,627	352	2,309	1,367	240	179.8	13.6	36.7	29.0
Texas Gulf Coast	1,816	841.3	144.9	445.3	235.6	22,964	4,052	16,012	4,905	1,655	812.3	128.7	399.2	243.6
La. Gulf Coast	586	289.1	59.1	168.4	35.1	9,853	3,569	4,546	1,239	549	288.9	60.7	134.3	50.2
N. La. and Ark.	86	34.4	6.3	21.1	6.3	3,872	663	1,741	138	83	35.6	10.3	19.3	7.0
Rocky Mountain:														
New Mexico	20	11.1		3.3	2.7	197		87	35	16	10.3	1.0	2.0	3.1
Other Rocky Mt.	251	127.9	6.0	56.4	37.1	5,370	263	2,174	763	244	123.0	4.2	55.8	41.4
California	996	443.2	5.6	116.9	311.0	18,101	407	12,859	29,344	1,074	464.4	5.4	161.6	373.0
December 10, 1954	7,105	3,512.7	383.6	1,539.6	1,125.6	150,653	34,210	124,067	52,803	6,964	3,529.0	377.6	1,440.7	1,246.8
December 3, 1954	6,962	3,487.1	364.9	1,598.1	1,079.3	151,378	35,430	131,432	54,355					
December 12, 1953	6,915	3,424.9	371.6	1,473.4	1,157.1	150,394	33,363	126,452	50,455					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.

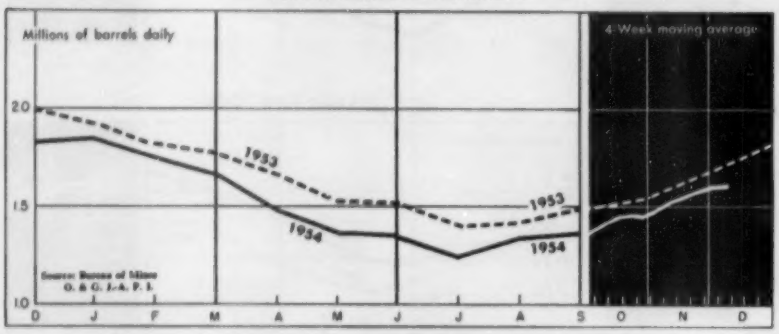
TOTAL GASOLINE DEMAND


Millions of barrels daily
Excludes jet-fuel components
4-Week moving average
1954
1953
Source: Bureau of Mines
O. & G. J.-A. P. I.
D J F M A M J J A S O N D

TOTAL MIDDLE-DISTILLATE DEMAND


Millions of barrels daily
Excludes jet-fuel components
4-Week moving average
1954
1953
Source: Bureau of Mines
O. & G. J.-A. P. I.
D J F M A M J J A S O N D

TOTAL RESIDUAL DEMAND



REPRESENTATIVE QUOTATIONS

Spot-market quotations of leading suppliers as of December 15, 1954. Prices are in cents per gallon, except for residual in dollars per barrel and wax in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline	10.375-11	11.25-12	10.50-10.75
Premium gasoline	11.5-12	13-13.75	11.50-11.75
42-44 w.w. kerosine	9.25-9.5	10.7	9.25-9.5
No. 2 straw fuel oil	8.5-8.625	9.95	8.75-9.0
No. 6 residual	$1.40-1.50	$2.35-2.45	$1.85-1.95

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	5.5	5.0	5.25
Grade 18-55	6.6	6.1	6.35

LUBRICATING OILS
Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	18
200 vis., No. 3 neutral, 0-10 pp.	13.25

WAX
Mid-Continent

132-134 A.M.P.	6.0

• Continuing cool weather in most of the important heating-oil areas has given distillate markets a boost. The advance of 0.6 cent on the East Coast is holding with movement reported as good. Gains in demand have added strength on the Gulf Coast.

PRODUCTION AND DEMAND—MAJOR PRODUCTS
(Thousands of barrels daily)

	Refinery prod.	Total demand
Gasoline:		
Four weeks ended 12-10-54	3,452	3,468
September 1954	3,511	3,586
November 1953	3,444	3,330
December 1953	3,453	3,253
Middle distillate:		
Four weeks ended 12-10-54	1,936	2,479
September 1954	1,815	1,415
November 1953	1,785	1,926
December 1953	1,794	2,707
Residual fuel:		
Four weeks ended 12-10-54	1,112	1,659
September 1954	1,086	1,368
November 1953	1,223	1,654
December 1953	1,247	1,809

CRUDE PRICES
GRAVITY SCHEDULE

	Signal Hill, Calif.*	Okla-homa, Kansas	Gulf Coast Tex.†	West Tex.‡
14-14.9	$1.87			
15-15.9	1.93			
16-16.9	1.99			
17-17.9	2.05			
18-18.9	2.11			
19-19.9	2.18			
20-20.9	2.24	$2.50		$2.37
21-21.9	2.30	2.52		2.39
22-22.9	2.37	2.54		2.41
23-23.9	2.45	2.56		2.43
24-24.9	2.53	2.58	$2.91	2.45
25-25.9	2.61	2.60	2.93	2.47
26-26.9	2.69	2.62	2.95	2.49
27-27.9	2.76	2.64	2.97	2.51
28-28.9	2.83	2.66	2.99	2.53
29-29.9	2.91	2.68	3.01	2.55
30-30.9	2.97	2.70	3.03	2.57
31-31.9	3.04	2.72	3.05	2.59
32-32.9	3.12	2.74	3.07	2.61
33-33.9		2.76	3.09	2.63
34-34.9		2.78	3.11	2.65
35-35.9		2.80	3.13	2.67
36-36.9		2.82	3.15	2.69
37-37.9		2.84	3.17	2.71
38-38.9		2.86	3.19	2.73
39-39.9		2.88	3.21	2.75
40 and above		2.90	3.23	2.77

*Standard Oil Co. of California. †Upper Texas Gulf Coast. ‡Includes New Mexico Permian.

Effective dates: California, February 16, 1953; east of California, June 15, 1953; Pennsylvania Grade, September 1, 1954.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
Bradford	3.35
Middle District	3.25
Southwest Pennsylvania	2.93
West Virginia	2.82
Ohio	2.76
Illinois Basin	2.95

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1—MODEL RL 3-Drum Cardwell Powered with Buda Model 844D Diesel Engine. Rig and Engine in Perfect Condition. 1-87' 2-Pole Mast. Box H-404, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE—Horizontal Duplex Steam Pumps—10x8½x12—353 GPM—bronze fitted—max. discharge pressure 100 lbs.—6" suction—5" discharge—mfg. by American Marsh Co. Quantity available—NEW—Boston Metals Co. 313 E. Baltimore St., Baltimore 2, Md., Curtis 7-5050.

COMPLETE RIG: New U-15 Drawworks with four 260 Horse Power Cummins diesel engines through hydraulic couplings, hydromatic brakes on 127-foot 450,000-lb. Lee C. Moore mast and substructure, 6,000 Ft. 4½" Drill Pipe, 14 new 7" O.D. x 2¹⁵/₁₆" Bore Drill Collars, new Emsco D-500 7½" x 16" pump, new Cameron twin hydraulic BOP, and all accessories. Good condition. Now drilling 8,000-ft. well in Rocky Mountain area. Inventory on request. Box H-403, The Oil and Gas Journal, Tulsa, Oklahoma.

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.

H. H. COFFIELD
Attn.: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

GASOLINE PLANT *FOR SALE*

Gasoline Plant, located in Brazoria County, Texas, shut down in January, 1954. Had been processing approximately thirty-three million feet of gas daily with absorber pressure approximately six hundred thirty pounds. Plant recovered Propane, Butane, Gasoline, Kerosene and Diesel Oil. Adequate storage tanks for all products. Drum Lead Blending Plant. Detailed inventory available upon request.

SOUTHERN PRODUCTION CO., INC.
P. O. Box 670, Ft. Worth, Texas

USED EQUIPMENT

Franks model 2000 Core Drill double drum drawworks; 48 ft. derrick; 5 x 8 pump; table, swivel, kelly, elevator, elevator links; mounted on 1946 International truck.

Franks SAL 8500 Skid Rotary Rig Cummins Power, 96' Derrick. Located, Tulsa, Oklahoma. O.C.S. Type 3 Servicing Unit mounted on 1942 Mack Truck. Located Odessa, Texas.

Write, Wire or Call

FRANKS MFG. CORPORATION
BOX 5218, WHITTIER STATION
TULSA, OKLAHOMA

FOR SALE EQUIPMENT

FOR SALE: Sullivan 200 complete with all tools ready to work. Located Tulsa, Okla. Contact R. F. Mesker, Phone 6-0057 or 5-9357, Tulsa.

FOR SALE: Wilson Titan—20" Gardner-Denver pump, 14" Gardner-Denver pump, 300-ton derrick equipment, Cameron Blow-out preventor, 10,500' 4½" drill pipe. Can be seen operating on location in Oklahoma. Write Box H-529, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 1954 Cessna, 195, equipped w/ Lear Exec. ADF, VHF, LF Marker Beacon, Dual landing lights, cross wind gear. Less than 80 hrs. total time. This plane offered for sale due to purchase of Twin Beech. Herley Supply Co., 3040 Cherry Avenue, Long Beach 7, Calif. Phone L.B. 41687 or Nevada 62087.

FOR SALE—Truck mounted seismograph instruments of modern design, built by Southwestern Industrial Electronic Company, with multiple geophones and Vector Cable—Shooting truck with Griffin body complete with loading poles and blaster—Metal dynamite magazine trailer—Field office equipment—Also Power reel, Vector Cable with 12 geophones for Marine operation. Box H-554, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE

150,000' of Used 8⅝" OD, 28.55# Machine cleaned and beveled for welding in excellent condition having been used for a products line, can be inspected our yard.

A. A. Gilbert Pipe & Supply Company, Box 986, Shreveport, Louisiana.

EQUIPMENT SPECIALS!

Columns: 8' x 28', 7' 6" x 56', 7' 4" x 70', 7' x 5' x 70', (2) 7' x 57' (400#), 7' x 42', 6' x 63', 5' x 62', 4' x 72', 4' x 47', (250#), 3' 6" x 63', 2' 6" x 60', 2' x 75', 2' x 45' (250#).

Heat Exchangers:

(5) 1,660 sq. ft. (Adm.), (2) 1,125 sq. ft. (850 lb.), 1000 sq. ft., 600 sq. ft. (Adm.), (5) 424 sq. ft. (Adm.), (5) 360 sq. ft., (4) 260 sq. ft.

60—Turbine driven centrifugal pumps, SS & Steel, 1" x 1" to 8" x 8".

2—6-stage Pacific pumps 730 GPM. 2,000 ft. hd.

2—Clark MA-4 150 BHP engines.

4 IR XVG-8 engines.

Goulds 16" 10,500 GPM. Pump. 135 ft. hd.

Oliver Filters: 8' x 10', 5' 3" x 8'.

5' x 12', 4' x 6' Drum Flakers.

Lab. Petrochem Furnace.

Detailed circular upon request.

BRILL EQUIPMENT COMPANY

4101 San Jacinto St., Houston 4, Texas, Locust 1351
New York Office, 2401 Third Ave.,
Telephone Cypress 2-5703
Sell us your surplus equipment

FOR SALE EQUIPMENT

WILSON GIANT—Cheap; 2—Waukesha 145 GK engines in good condition; rig used for work-over. Includes Kelco spinning and Foster Breakout Catheads; pump drive and rotary drive. Call Madison 1923, Houston or Amhert 7-3311, Wichita, or write P. O. Box 2001, Wichita, Kansas.

FOR SALE: 2—Cardwell RL double-drum spudders complete with lines and tools, also spare 145 H.P. GKU motor and transmission. Now working in Oklahoma. Oklahoma City, Oklahoma, Phone ME 7-2242. Write: Box 4294.

FOR SALE—In Lindsay, Oklahoma field, 7—high 500 bbl. erected flat seam used bolted steel tanks. Price $350.00 each, as is. Contact T. P. Mace, ME 6-3331, Oklahoma City, Cities Service Oil. Patridge, Bartlesville, Oklahoma.

FOUR FAIRBANKS-MORSE ZC-208 Oil Well pumping engines complete with clutch and 15" PD sheave ($450.00 ea.) F.O.B. McCamey. These engines are in good condition. Thompson's Specialties, Phone 231, Box 1118, McCamey, Texas.

FOR SALE: 1—7¼" x 12" FZ-FXZ Gardner-Denver Pump unitized w/ Model 6LROU Waukesha Gasoline—Natural Gas—Butane Engine and #8A Demco Circulating Type Rod Oiler. Pump has been in use less than 60 days. Box H-545, The Oil and Gas Journal, Tulsa, Oklahoma.

FULL FACTS, 8" x 10" PHOTOS AIRMAILED ON REQUEST, CALL LOUISVILLE—WABASH 6003

EQUIPMENT BUYS

CATERPILLAR HT4 SHOVEL, Ser. #7U2125ISP, with electric starting, 1000 lb. counter weight, track roller guards, crankcase guard, 15" raised center flat tracks 1¼ cubic yd. bucket. This machine shows only 1,030 hrs. on the hourmeter and has just been thoroughly gone over in our shop. Excellent appearance and performance.
f.o.b. Evansville, Ind $7,250.00

CATERPILLAR DIESEL D6 TRACTOR, Ser. #8U2241 with Caterpillar 6A Dozer and #46 HCU. This is a standard gauge machine with 18" track shoes and crankcase guard. Checked over, repairs made, cleaned and painted, an outstanding buy at the price—
f.o.b. Louisville, Ky. $4,950.00

CATERPILLAR DIESEL D6 TRACTOR, Ser. #9U5584, with Cat 6A angledozer and Cat #24 CCU. This machine has 18" grouser shoes, large front idlers, crankcase guard, front pull hook and electric starting. The engine of this tractor has been worked over and the entire machine is in good condition. Price—
f.o.b. Ashland, Ky. $4,750.00

WHAYNE SUPPLY CO.

800 W. MAIN ST.—LOUISVILLE, KY.
ASHLAND, KY. • BOWLING GREEN, KY.
PADUCAH, KY. • EVANSVILLE, IND.

FOR SALE EQUIPMENT

GAS METERS, Westcott and Foxboro orifice meters and controllers, Bristol recording pressure gauges. Geo. R. Milner, Box 124, Okmulgee, Oklahoma.

FOR SALE—250 KW Westinghouse Electric Generator Set, 300 hp Sterling Natural Gas engine, 440-220 V AC, unit steel base, excellent condition, reasonably priced. W Caplis, Box 1312, Shreveport, Louisiana.

CORE DRILLS—Acker Model for 150' coring $1855. Acker Model for 350' coring $2715. Acker Model for 800' coring $5410. Everything for well drilling. S. W. Pressey & Son, Pueblo, Colo.

U-15 WITH hydromatic brakes, powered by four 250 Horse Power Cummins diesel engines through hydraulic couplings with 127' Lee C. Moore mast, 4½" drill pipe, 6¼" drill collars. Oilwell 14P pump, mechanical Shaffer double BOP and all accessories for complete rig. First class operating condition. Rocky Mountains. Inventory on request. Box H-465, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 3600' 4½" extra hole drill pipe, good for shallow drilling, $.90 per foot. Terms. Melton Supply Company, Box 1360, Seminole, Okla.

5 USED 8' x 31' ½" Thick Riveted Vessels. 1—14" x 2½" x 14". 3—26 x 5¾ x 20. Simplex plunger Reciprocating Steam Pumps. Kell Jones & Son, Beaumont, Texas.

FOR SALE—6000' of used 3½" OD drill pipe, full hole Range 2, suitable to drill 3000', priced $1.50 per foot, will sell any amount. A. A. Gilbert Pipe & Supply Company, Box 986, Shreveport, Louisiana.

HALL SCOTT INVADER Engine Parts. New war surplus, large inventory, 50% to 75% discount, send for parts list. Abar Metals Company, 1902 E. Olympic Blvd., Los Angeles 21, California.

FOR SALE: 5000' rig. 1 250 Bethlehem complete drilling rig less derrick. 5000' drill pipe. Compound with two D-13000 Cats and 14 inch Bethlehem pump. Located: Wampler Bros., Box 1967, Longview, Texas. Phone PL 92312.

MAYHEW MODEL 2000 Drill, fully equipped and in good condition. Purchased new October 1953. For inventory and price, write H. M. Ramsey, P. O. Box 207, Robinson, Illinois.

FOR SALE: Franks Well Servicing Unit with mast on International KB-8 truck. McDaniel Well Service, Seminole, Oklahoma.

RENTAL TOOLS—Fishing and drilling—blowout preventers—shale shakers—Office and warehouse space. Nelson Sales & Rental Tool Co. 915 SE. 29th, Oklahoma City, Oklahoma. Phone MElrose 7-9366.

FOR SALE—Near Burrton, Kansas 3—100 HP single cylinder horizontal Clark engine compressor units with 16" x 20" Speltz overhead power cylinders, and 16" x 20" Clark compressor cylinders. Price, as is, $2500.00 each. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

FOR SALE—WELLS FOR SALVAGE

38 wells, 2" line pipe, power houses, welded tanks and miscellaneous equipment. If interested write Phil Stekoll, Box 5, Okmulgee, Oklahoma, or call 376, Okmulgee, Okla.

FOR SALE: 2—TC-44-15 Lufkin Twin Crank Pumping Units, 19.8 H.P. 46" Stroke with Model DE Case Engines, Belts and Sheaves complete. 2—TC-3-18B Lufkin Twin Crank Pumping Units, 33 H.P. 54" Stroke with 25 H.P. Cooper-Bessemer 2-Cylinder Vertical Gas Engines, Belts and Sheaves complete. All equipment reconditioned and in good shape. Overton Supply Company, P. O. Box 846, Phone 2721, Overton, Texas.

FOR SALE: New Wilson Giant—127' Mast, 18" Oil Well pump, Cameron Blowout preventor, 9,000' 4½" drill pipe. Can be seen operating on location in Oklahoma. Write Box H-528, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE—7000 feet of good used 4½" Drill Pipe. For complete description and price, write P. O. Box 9368, Fort Worth, Texas.

FOR SALE: One U-15 Rotary Rig, Complete, Jack Smith, 502 Combs-Worley Bldg., Pampa, Texas. Phone 4-2682 or 4-9814.

FOR SALE at our Oklahoma City Warehouse 2850' 3½" OD 9.3# 10V thread used seamless steel upset tubing. Price 50 cents per foot. Take all. Cities Service Oil Company, Patridge, Bartlesville, Oklahoma.

FOR SALE EQUIPMENT

FOR SALE: ENGINE—165 Hp. Climax Model R61, maximum continuous Hp. rating 126 Herndon Drilling Company, 421 Mayo Building, Tulsa, Phone 4-9700.

FRANKS MODEL J.E.T. 5000, Murphy Diesels. Rig complete with drill pipe. Perfect condition. Drilled less than 75,000 feet of hole. Willis Mevis, 317 Haberfelde Building, Bakersfield, California, FAirview 3-2480.

SALES and rentals of cable drilling and fishing tools, casing and equipment, from the Southwest's largest stock of used cable tools and oil field supplies. Degen Pipe and Supply Co., Tulsa, Oklahoma.

EQUIPMENT WANTED

CASH FOR TRUCK or Trailer Mounted Rotary, 2500' minimum depth. Description must be complete and priced right. Box 650, Great Falls, Montana.

WILL PAY highest prices for used casing, used line pipe, abandoned leases, or other surplus lease equipment. Your idle producing equipment is worth dollars. Green Pipe & Supply Co., Box 1303, Tulsa, Oklahoma.

LATE MODEL air unit or National drawworks, without engines, suitable 6000 ft. drilling. One package used gas compressor, discharge 800#, intake 350#, 750,000 ft. per day. Box 297, Tyler, Texas.

HELP WANTED

WANTED: SUPERINTENDENT for Construction Co. who build oil field roads and locations. Permanent opening. Give age, experience and references. D S & R Construction Co., P. O. Box 1216, Sweetwater, Texas.

PETROLEUM ENGINEER, preferably recent graduate, for West Texas and New Mexico work. Duties to assist in production and reservoir engineering. Operating subsidiary of large corporation. Reply giving age, college record, previous experience, if any, military status, and address and telephone number of one character reference. Box H-546, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES MANAGER

Diesel Engine Manufacturer desires Sales Manager for Oil Fields. Write, giving complete resume of experience and personal history. Replies will be held in confidence.

BOX H-556,

THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA

OPERATORS
PETROLEUM REFINERY

Minimum five years experience in petroleum refinery operations to supervise initial operations and instruct personnel in operation of petroleum refinery units now being constructed in US and abroad. Responsibility will be similar to refinery Shift Foreman.

Challenging opportunity. Excellent base salary, plus bonus and subsistence allowance.

Interviews arranged in New York City at our expense on basis of confidential, complete record of education & employment (names & addresses of employers, dates employed, positions held, salaries received, and types of units operated). Airmail to

PERSONNEL DEPARTMENT:

HYDROCARBON RESEARCH, INC.
115 Broadway New York 6, N. Y.

HELP WANTED

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

PETROLEUM ENGINEER under 35, drilling and production work, Rocky Mountain area, with compact but enterprising operator, excellent financial structure. Salary dependent upon experience and qualifications. Send detailed experience record. Box H-543, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERS for aggressive manufacturing company in midwest. Graduate engineers or engineering background, in design or development work for control equipment, used in oil and gas production. Organization also needs sales engineers experienced in above lines. Company offers excellent benefits with salary review every six months. Salary range $5000 to $7000. Company pays our service charges. All information confidential. Send resumes to Chas. J. Loveless Personnel Service, 616 S. Main, Tulsa, Oklahoma.

GEOLOGIST FAMILIAR with West Texas and Southeastern Lea County, New Mexico, wanted by an active independent concern. State previous experience and give full references. Box H-555, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED, One Toolpusher, must have proven background, no floaters; when you prove your ability, you will get above average salary. When you reply, advise experience and where you worked before. Box H-550, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEERS, Executives, Technical Men. Salaried positions—$6,000 to $30,000. This confidential service for outstanding men who desire a change of connection. Will develop and conduct preliminary negotiations without risk to present position. Send name and address for details. Tomsett Associates, 434 Frick Bldg., Pittsburgh 19, Pa.

FOREIGN EMPLOYMENT

INSTRUMENT REPAIR MEN

Minimum five years in oil refinery, chemical plant or closely related field.

REFINERY OPERATORS

Minimum five years experience in crude distillation, thermal reforming, hydroforming or asphalt units.

Applicants should be high school graduates and capable of working with and training Saudi-Arabs.

Write giving full particulars regarding personal history and work experience.

Recruiting Supervisor, Box 95

ARABIAN AMERICAN OIL COMPANY
505 Park Avenue
New York 22, N. Y.

PETROLEUM ENGINEERS

Experienced graduate engineers or recent graduates, for immediate and future job openings in Saudi Arabia and New York City. For engineering work in development, production, drilling, process, and oil and gas engineering on primary and secondary recovery problems.

Salaries commensurate with education and experience. Write giving full particulars regarding personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 79

ARABIAN AMERICAN OIL CO.
505 Park Avenue, New York 22, N. Y.

HELP WANTED

GRADUATE ENGINEER OR GEOLOGIST
At least five years experience with cable tool and rotary drilling methods and Turbine pumps—to design SELL and supervise construction of water wells in Minn., N. D., S. D., Mont., Wisc., Iowa for industry and municipalities. Salary plus profit sharing. Give all experience and references in detail in first letter. All replies held strictly confidential. McCARTHY WELL COMPANY, 670 Eustis St., St. Paul, Minn. NATION'S OLDEST and N.W.'s LARGEST SINCE 1860.

EXPERIENCED OILFIELD ENGINEER

Graduate with 4 - 6 years varied field and production control experience, some in floods, for staff position with progressive nationally known independent. Heavy development program will require long hours intensive application and some travel in Texas, Illinois, Indiana, Kentucky, Kansas and Oklahoma. Unusual opportunity for man qualified and willing to assume heavy responsibilities. Letters giving full details will receive utmost consideration. Our engineers know of this advertisement. Reply in confidence to

BOX H-557,

THE OIL AND GAS JOURNAL,
TULSA, OKLAHOMA.

SITUATIONS WANTED

REFINERY MANAGER: Experienced foreign operations all phases modern refinery organization and management, labor and foreign government relations. U. S. Citizen Box H-536, The Oil and Gas Journal, Tulsa, Oklahoma.

DRILLING & PRODUCTION Supt., available, 20 yrs. experience Oil & Gas, 43 yrs of age, married, sober, best of reference Box H-505, The Oil and Gas Journal, Tulsa, Oklahoma.

MANAGEMENT WITH aggressive independent with opportunity to participate. Eighteen years experience, management land, production, and drilling departments. Box H-537, The Oil and Gas Journal, Tulsa, Oklahoma.

GRADUATE PETROLEUM ENGINEER, 36, married, desires position with independent producer or independent oil company. Have had 10 years experience as petroleum engineer and administrative assistant with major oil company and as drilling superintendent for drilling contractor. Box H-552, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTORNEY: One year general legal experience, engineering graduate western mining school, seeks position in legal department petroleum company or law firm practicing in this field. Box H-549, The Oil and Gas Journal, Tulsa, Oklahoma.

LANDMAN-GEOLOGIST desires retainer in Houston. Experienced in all phases of leasing, drilling deals, farmouts. Young, ambitious, family man. Box H-548, The Oil and Gas Journal, Tulsa, Oklahoma.

INDUSTRIAL LUBRICATION Specialist, 26 years training and experience in sales, application and technology. Services available full or part time in vicinity of Houston, Texas. Box H-553, The Oil and Gas Journal, Tulsa, Oklahoma.

Well organized, well established oilwell drilling contractor desires the management and supervision of oil properties in West Texas, Central Texas, and New Mexico. Can provide complete handling of oil properties, from acquisition to production. No properties too small, and none too large to handle. Inquiries from independents, groups, small or medium sized oil companies invited

Write, wire, or call collect for further information.

MAKIN DRILLING COMPANY

P O Box 1628, Hobbs, New Mexico.
Phone 3-3141.

146 Allen Building, Midland, Texas.
Phone 3-3962.

REAL ESTATE

OFFICE AND WAREHOUSE SPACE. Industrial or oil-field equipment preferred. Telephone, shipping, and receiving service. 915 SE. 29th, Oklahoma City, Okla. Phone MElrose 7-9366.

ROYALTIES

WISH TO BUY producing royalties. Box H-379, The Oil and Gas Journal, Tulsa, Oklahoma.

JACK EAGLE, Oil Properties, 706 City Nat'l. Bld., Oklahoma City, Oklahoma, Telephone REgent 6-7027.

LEASE AND DRILLING BLOCKS

200 ACRES for oil or gas development in Greenwood County, Kansas, offsetting old gas field which also produced oil. Geologically located on complete enclosure. Will sell or farm out on a drilling deal for small override. C. H. Barker, Box 91, Toronto, Kansas.

OIL AND GAS LEASES
$1.50 per acre. Ten year leases, 25 cents acre annual rentals. 2,000 acres St. Francis County, Arkansas. Major oil companies own nearby leases. A. W. Buford, Forrest City, Arkansas.

KANSAS WATER FLOOD oil lease for sale, has 1200 acres, five wells plus water wells, Gaso pressure pump, tanks and other equipment, owner Mr. O'Chamis, G. Dehne, Chanute, Kansas, Ph. 1215.

OIL & GAS lease S.W. ¼-9-17-15. Barton County, Kansas, and S.W. ¼-15-16-15 Plaquemines Parish, Louisiana, $1 per acre yearly. Louis Seidl, Otis, Kansas.

SUPERIOR OIL CO. holds ⅓ of this mineral lease, will lease the other ⅔ interest, 64.4 acres undivided net of 96.6 tract, Young County, Texas. About 6 miles N.E. Eliasville. For 3 year lease, $100.00 per acre, OK as approved by attorney. Lessee to pay title check. Inquiries, P. O. Box 722, Clifton, Arizona.

SEE A. L. BOWLES, Box 947, Ada, Okla., for drilling deals and producing royalties if you have the cash for Oil Investments.

Will pay cash instantly for lease (large blocks), royalties, mineral deeds, production. Write fully—P. O. Box 2153, Denver, Colorado.

LEASES ROYALTIES

Producing and Nonproducing
Bought and Sold—Any Area

Inquiries Invited

B. D. BUCKLEY

6635 Delmar Ave., St. Louis, Mo.

SOIL ANALYSIS

SOIL ANALYSIS
Learn a better method of finding oil. Test hydrocarbons from oil directly. Do it yourself. Free details. Surfac Oil Surveys, Box 10216, Fort Worth 14, Texas.

URANIUM

NEW CORPORATION needs used Winter-Weiss, Mayhew, Failing, on 100 uranium claims. Will exchange common shares for rig; cash hedged for exploration. We are experienced operators. Write: John Schmitz, Uranium Claim Owners, Inc., Box 1285, Grand Junction, Colorado.

URANIUM
Purchasers wanted for uranium claims. Evaluated by our company at cost. We get no profit unless purchaser obtains production. Also, we offer a prospecting service with radiation surveys and diamond core drilling on a cost basis plus part interest in claims. Atomic Drilling and Exploration Co., Ltd. P. O. Box 1554—1223 Luisa—Santa Fe, New Mex. Phone 3-4757.

WANTED

MANUFACTURERS' REPRESENTATIVE
Established corporation in Houston serving Oil, Chemical and Paper Industries in Louisiana and Southern Texas, now handling process equipment and corrosion proof construction materials, desires related accounts. Box H-541, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED—IDEAS
Inventions that are related or can be adapted to the oil industry. We offer capital, technical advice, patent assistance, market research, a manufacturing plant, and a sales outlet; everything to put your invention on the market. Write P. O. Box 1665, Houston 1, Texas

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

BUSINESS OPPORTUNITY

RECENTLY ORGANIZED Eastern group with venture money for drilling of wildcats, development, farmouts. You are dealing directly with principals. Box H-538, The Oil and Gas Journal, Tulsa, Oklahoma.

RECENTLY ORGANIZED group seeking proven oil property with an income of $10,000 to $40,000 per month. You are writing directly to the principals. Prompt action. Box H-526, The Oil and Gas Journal, Tulsa, Oklahoma.

ACTIVE COMPANY desires to acquire oil and gas producing properties. All offers will receive full consideration and prompt attention. Box H-523, The Oil and Gas Journal, Tulsa, Oklahoma.

PRINCIPAL WILL PURCHASE: Oil Property from Independent, or—**Producing Oil Co.** (stock or property),—**Oil Royalty Co.**, either stock or property where Purchase Price Valuation is $200,000.00 and up.

Box H-547, The Oil and Gas Journal, Tulsa, Oklahoma.

MANUFACTURER'S REPRESENTATIVE
Graduate Engineer, (registered professional), with extensive contacts, is establishing an agency to represent manufacturers of oil field and associated equipment in the Rocky Mountain region. Will handle sales, engineering and servicing of drilling, production, pipeline and lease equipment. Has had 12 years broad experience in manufacturing, engineering, selling and servicing of oil field equipment in the mid-continent and Rocky Mountain areas. If your product needs effective representation write:
Box H-551, The Oil and Gas Journal, Tulsa, Oklahoma.

Manufacturers Agent

Specializing in Pipeline and Tankage Equipment
Will
Represent Additional Lines
We offer sales, installation, service and Warehouse facilities.

H. & H. Co.

583 N. Union Pl. Tulsa Phone 54-0308

CANADA

(Continued from page 165)

M.c.f. per day with pipe recovery of 100 ft. gas-cut mud.

Basal quartz . . . On the Alexander Indian Reservation, 23 miles northwest of Edmonton, Union Oil Co. of California found gas and some oil in the basal quartz. The 10-17 Alexander, LSD 10, 17-56-27w4, flowed gas at the rate of 4,800 M.c.f. per day.

ROCKY MOUNTAIN

COLORADO

West Flank Julesburg Well Creates Interest

Wide publicity was given the S. D. Johnson, T. J. McLarty and others 1 Pallaoro, SW NE NW 7-5s-69w, wildcat west of Denver in Jefferson County, Colorado. The well is located in a highly faulted area against the front range of the Rocky Mountains. The operators reported a gas and oil kick

while drilling in a limey zone of the Benton shale (?) and on drill-stem test of the zone 8,958-9,003 ft. reported recovery of 6,500 ft. of high gravity, mud-cut oil in 4 hours. There has been no previous production in the area and location of the test created considerable local interest. The operators are drilling ahead for Dakota sandstone. Commercial production along the extreme west flank would be of considerable importance and considerably extend the general production trends through the Denver-Julesburg basin.

Gulf Tests Paradox Gas in Montezuma County Wildcat

Gulf Oil Corp. had a small flow of gas from Paradox at 1 Fulks, C NW NW 27-37n-17w, wildcat in Montezuma County. Top of Paradox was logged at 5,650 ft. and on drill-stem test 6,300-6,484 ft. there was gas at the surface in 8 minutes. Maximum flow was 3,000 cu. ft. per day. There was a recovery of 360 ft. of heavily gas-cut mud. Gulf is drilling below 6,484 ft. on the well.

UTAH

Carter Completing Bluebell Discovery

Carter Oil Co. has cemented casing at 9,725 ft. total depth, at 2 Bluebell Unit, C SW NW 3-1s-2w, wildcat in Duchesne County. This well had high pour-point oil recovery on a series of drill-stem tests through basal Green River formation and is rated as a discovery comparable with other fields of this portion of the Uinta basin.

Successful Wildcats

TEXAS GULF COAST

Aransas County: Arnold O. Morgan and B. A. Wales 1 Stanley et al, John H. Phillips Sur., A-175. IP 190.5 BOPD, 10/64-in., 38.7°, perforations 7,804-7 ft., and 19,500 M.c.f. daily, open-flow potential, GOR 76,500 cu. ft. per barrel, 65°, perforations 7,675-80 ft. TD 8,974 ft. (New pay in, and extends East Aransas Pass field. New pay, 7,800-ft. sand.)

Kleberg County: Sun Oil Co. 1-A State, Tract 976, Gulf of Mexico. IP 9,300 M.c.f. daily, open-flow potential, Frio 9,112-38 ft. TD 9,238 ft. (New field discovery—offshore location drilled directionally from surface location on Padre Island shore.)

Liberty County: John W. Mecom et al 1 Merchant et al, H&TC Sur. 193, A-239. IP 184 BOPD, 12/64-in., 33.4°, Yegua EY-1A sand 8,690-8,700 ft. (perforations), and 215 BOPD, 12/64-in., 32.1°, Yegua EY-1 sand 8,764-78 ft. (perforations). TD 9,271 ft. (Extends Hull-Merchant field—1/5 mile southeast Hull townsite.)

Live Oak County: Houston Oil Co. of Texas and Ellis B. Colvin 1 Reeves Brown, Patrick Nevin Sur., A-31. IP 27.28 BOPD (net), 20/64-in., perforations 3,394-98 ft. TD 3,682 ft. (New field discovery 1½ miles northeast of Cornelia.)

Victoria County: South Texas Oil & Gas Co. 1 Tolson, Survey 46, A-450 (12 miles northeast of Victoria). IP 4,100 M.c.f. daily, open-flow potential, dry, perforations 3,121-25 ft. TD 4,100 ft. (New field discovery.)

Willacy County: Superior Oil Co. 5 Yturria, San Juan de Carricitos Sur., A-8. IP 38 BOPD (net), 18/64-in., 42.3°, Frio 6,162-64 ft. (perforations). TD 7,638 ft. (New pay in La Sara field—6 miles northwest of Raymondville.)

WEST CENTRAL TEXAS

Callahan County: G. Jack Carter 1 Caldwell, George Hancock Sur. 355, 2 miles SW Denton. IP 84 BOPD, ⅞-in., 38°, TP 60 psi., GOR zero, Cook sand 1,712 ft. TD 1,720 ft.

NORTH TEXAS

Clay County: L. T. Burns 2 Garrett, George Gardner Sur., A-165, 1½ miles NW Shannon. IP 124 BOPD, 16/64-in., TP 180, 42°, GOR 440, Strawn perforations 4,203-12 ft. TD 4,351 ft.

Wilbarger County: R. W. McDonnall 1-B Waggoner, 9-4-H&TC, 8 miles SE Grayback. IPP 44 BOPD, 37°, Cisco sand 2,482-92 ft. TD 2,506 ft.

WEST TEXAS

Reagan County: The Texas Co. 1 Young, Sec. 1, GC&SF Sur., A-170, 4 miles SW Big Lake. IP 1,669 BOPD, 28/64-in., TP 800 psi., GOR 243, 44.3°, Fusselman pay 9,284 ft. TD 9,346 ft., elev. 2,677 ft. ground, top Fusselman 9,284 ft.

Runnels County: Cree Oil & Exploration Co. 3-A McMullan, Lot 2, A. Loysoya Sur. 515. IPP 10.44 BOPD, 44°, pay 3,394-3,400 ft. TD 3,650 ft.

ILLINOIS

Christian County: Herring et al 1 Pickering et al, NE NE NW 19-14n-3w. IPP 7 BOPD, Silurian 1,803-8 ft. TD 1,843 ft. (Extends West Edinburg pool.)

MICHIGAN

Cass County: B. W. Combs 1 Carter C E½ E½ SE 1-7s-14w, Traverse 929 ft., IPP 35 BOD, TD 941 ft. (New poo',)

Lenawee County: William J. Morriss 1 Downing, NW NW SE 1-6s-5e, Trenton 2,408 ft., 100,000 cu. ft. gas, IPP 20 BOD, Pays 2,415-25; 2-450-54; 2,471-74 ft., TD 2,491 ft. (New pool.)

WEST VIRGINIA

Wood County, Steele district: Godfrey L. Cabot, Inc., 1423 Fee, elevation 647 ft., 320,000 cu. ft. gas, Corniferous 4,455 ft., Oriskany sand, 4,544-85 ft., gas 4,576 ft., TD 4,590 ft.

SOUTH LOUISIANA

Cameron Parish: Stanolind Oil & Gas Co. 1 Gardiner estate, 7-12s-9w. IP 552 BOPD, 12/64-in., 31.7°, Miocene 13,586-13,600 ft. (perforations). TD 13,975 ft. (New oil pay, and extends Big Lake field 1½ miles northwest of production.)

Forest Oil Corp. 5 Miller, 20-15s-5w. IP 30 BOPD and 2,290 M.c.f. daily, 10/64-in., 37.5°, Miocene 11,865-80 ft. (perforations). TD 13,786 ft. (New pay in Crab Lake field.)

Lafourche Parish: Howell, Holloway & Howell, 2 Energy, 55-15s-16e. IP 82 BOPD and 1,910 M.c.f. daily, 10/64-in., 44.9°, perforations 12,628-36 ft. TD 12,750 ft. (New pay in Chacahoula northeast extension area.)

Plaquemines Parish: California Co. 1 State Lease 2557, Block 67, Main Pass Area, Gulf of Mexico. IP 120 BOPD, ⅛-in., 36°, perforation 6,875-80 ft. TD 8,011 ft. (New field discovery.)

Terrebonne Parish: Humble Oil & Refining Co. 1-P LL&E., Township 22s-15e (waterbed location 5½ miles southwest of Dog Lake field). Shut-in gas well, no gage, perforations 14,296-14,306 ft. TD 15,025 ft. (New field discovery.)

NORTH LOUISIANA

Catahoula Parish: E. C. Wentworth 1 Rhone, C NE NE 7-6n-7e. IPP 50 BOPD, Wilcox 5,311½-13½ ft., 39°. TD 6,309 ft. (Opens River Slough field.)

Claiborne Parish: Stanolind 1 Washington, 28-22n-5w. IPF 193 BOPD, Smackover 10,358-89, 10,398-10,404, 10,413-21, 10,433-35 ft., 53°, 10/64-in. TD 10,994 ft. (New pay for Antioch field.)

DeSoto Parish: N. B. Hunt 1 Oden, 35-14n-14w. IP 20,000 M.c.f. of dry gas per day, Eagle Ford 2,854-62 ft. TD 6,900 ft. (Shut in gas discovery.)

ARKANSAS

Pope County: Murphy Corp. 1 Barton, C NE SW 10-8n-19w. IP 1,900 M.c.f. of gas per day, Atoka 3,993-4,003 ft., ¼-in. TD 5,508 ft. Discovery of Moreland area in rank wildcat area of McAlester-Arkansas Valley basin. The new gas field is 8½ miles northeast of Russellville.

OKLAHOMA

Greer County: Sherman McKown 1 Galner, NE NE SW 5-6n-21w. IPP 60 BOPD, sand 570-86 ft. TD 586 ft. (Oil discovery.)

Logan County: Lang & Unger 1 Bohanon, SE NE NW 34-15n-3w. IPF 27 BOPD, Dolomite 6,174-84 ft. TD 6,370 ft. (Oil discovery.)

Nowata County: E. J. Athens 1 Stover, NW NW NW 17-28n-15e. Oil from Bartlesville sand at 1,150-57 ft., 32°. TD 1,172 ft. (Oil discovery.)

Kay County: Manahan Oil Co. 1 Bowman, SE SE NW 35-27n-1e. IPP 71 BOPD, Lower Skinner sand 3,702-10, 3,714-30 ft., 38.2°. TD 3,871 ft. (New pay for West Garrett pool).

Noble County: T. O. Lilystrand, Jr. 1-A Freeze, W½ NE NE SE 20-22n-2w. IPF 120 BOPD, Misener sand 5,171-75 ft. TD 5,175 ft., 41°. (New pay for Northwest Polo pool.)

Osage County: Service Drilling Co. 5 Osage, NE NE SE 12-25n-6e. IPF 1,087 BOPD, Mississippi chat, 2,882-91 ft., Burbank sand 2,814-38 ft. TD 2,891 ft. (New pay for Northwest Little Chief pool).

KANSAS

Barton County: Schermerhorn Oil Corp. 1 Bissell Point, NE SE SE 10-19s-13w. IPP 172 BOPD, Lansing 3,276-81 ft. (Opens Bissell Point field.)

Barber County: Anschutz Drilling Co. 1 Lonker, NE NE NE 25-32s-13w. IPP 161 BOPD, Mississippian 4,472½-74½, 4,480-93 ft. TD 4,970 ft. (Opens North Medicine Lodge field.)

The Chicago Corp., M. B. Armer and Cohen 1 Davis Ranch, C NE NE 11-35s-15w, IPP 32 BOPD, 25°, Miss. 4,982-5,003 ft. TD 5,777 ft. (Opens Salt Fork pool.)

Ellis County: Transit Corp. and Davis Bros. 1 Lang, NE SW NW 8-14s-17w. IPP 125 BOPD, Arbuckle 3,547-53 ft., 37°, TD 3,553 ft. (Opens Youngersouth pool).

Graham County: Leo Wentworth Oil & Development Co. 1 Walts, 10-8s-25w. IPP 175 BOPD, Kansas City lime 3,867-72 ft., 46.5°. TD 3,965 ft. (Opens Northeast Schmied pool).

N.C.R.A. 2 Van Loenen Est., NE NE NE 14-8s-22w. IPP 115 BOPD, Arbuckle 3,872-75 ft., 22.2°. TD 3,875 ft. (Opens Van pool).

Petroleum, Inc. 1 Noah, NW SE NW 33-10s-21w. IPP 103 BOPD, Marmaton

3,756-64 ft. TD 3,830 ft. (Opens Southwest Noah pool).

Marion County: Anderson-Prichard Oil Corp. 1 Hett, SW NE SW 3-19s-2e. IPP 43 BOPD, Simpson 3,039-41 ft. TD 3,130 ft. (Oil discovery).

Rooks County: Harold Patton 1 Fike, NW NW SE 5-9s-17w. IPP 202 BOPD, Kansas City 3,336-40 ft. (Opens Southeast Dopita pool). TD 3,475 ft.

Stafford County: Deep Rock Oil Corp. 1 Tanner, NE SW NW 23-25s-14w. IPF 208 BOPD, Kansas City 3,848-58 ft. TD 4,327 ft. (Opens North Kipp pool.)

Capitt Drilling, Inc. 1 Schifferdecker, SE SE NE 20-34s-2e. IPP 7½ BOPD, Miss. 3,521-32 ft. TD 3,532 ft. (Opens East Ashton pool).

Sumner County: Time Petroleum Co. 1 Gerberding, SE NE NE 6-34s-4w. IPP 25 BOPD, Simpson 4,710-21 ft. TD 4,723 ft. (Opens Gerberding pool.)

NEBRASKA

Banner County: Rex Petroleum Co. 1 Johnson estate, C SW NE 27-18n-53w. IPP 100 BOPD, "J" sand discovery, new field. TD 5,466 ft. Dakota.

CALIFORNIA

Kern County: Lake Oil Co. 1 Crane, SW NW 34-11n-19w, IPF 344 BOPD, 12/64-in. choke, gravity 29.9°, perfs. 5,700-95 ft., TD 5,867 ft. (About ¼-mile south extension to Olcese pool of Tejon-Grapevine field.)

MONTANA

Powder River County, Pumpkin Creek: George J. Greer, Trustee 1 Allen, SW SW SE 24-1s-49e. IP 15,500 M.c.f. of gas per day, Eagle sand gas discovery, new field. TD 3,138 ft. (First commercial production in northeastern Powder River basin). Well drilled as strat test.

WYOMING

Carbon County, South Baggs: Phillips Petroleum Co.-Kerr-McGee Oil Industries, Inc. 1 South Baggs-Government, C NE NW 9-12n-92w. IP 4,700 M.c.f. of gas per day, Lewis discovery, new field. TD 8,125 ft. Parkman.

Park County, Meeteetse: Trigood Oil Co. 1 Government, C SE NW 28-49n-99w. IPP 100 BOPD, Phosphoria discovery, new field. TD 11,471 ft. Tensleep.

Sublette County, Tip Top: General Petroleum Corp. 73-21, NW SE NE 31-29n-113w. IP 768 M.c.f. of gas per day, Muddy discovery, new field. TD 7,665 ft. Muddy.

UTAH

San Juan County, Desert Creek: Shell Oil Co. 2 Desert Creek, SE SE 35-41s-23e. IPF 248 bbl. of fluid per day, cut 3 per cent, Paradox discovery, new field. TD 7,230 ft. Cambrian. (First commercial oil in Paradox basin.)

COLORADO

Jackson County, Battleship area: Lion Oil Co. 1 Dwinell, C NE SW 23-10n-79w. IPP 195 BOPD, Dakota discovery, new field. TD 4,673 ft. Lakota. (Revived interest in North Park basin.)

LaPlata County: U. S. Smelting, Refining & Mining Co. 1-21 South Ute, SW SE NW 21-33n-9w. IPF 500 M.c.f. of gas per day, Fruitland discovery, new pay. TD 3,025 ft. Pictured Cliffs sand.

U. S. Smelting 1-X Arvil Brown, NE SW SE 15-33n-9w. IP calculated open flow 40,000 M.c.f. of gas per day, Dakota discovery, new field. TD 7,965 ft. Dakota.

Washington County: Petroleum, Inc. 1 Larsen, C NE NW 19-1s-55w. Swabbed 4½ BOPH, "D" sand discovery, new field. TD 5,180 ft. Skull Creek.

Weld County: Virgil O. King and New Drilling Co., Inc. 1 Government, C SW NE 26-8n-56w. IPF 17 BOPH, "J" sand discovery, new field. TD 5,806 ft. "J" sand.

ARIZONA

Apache County, East Boundary Butte: Shell Oil Co. 2 East Boundary Butter, C SE NW 3-41n-28e. IPF 13 hours at the rate of 2,200 M.c.f. of gas per day. TD 6,339 ft. (First commercial production in Arizona.)

SASKATCHEWAN

Imperial 9-26 Nottingham, LSD 9, 26-4-32w1. Mission Canyon oil well. TD 3,625 ft.

ALBERTA

Cuba 3 Harish, LSD 3, 12-50-27w4. Cardium gas well. TD 3,074 ft.

Socony-CPR 14-11 Granta, LSD 14, 11-22-19w4. Potential Miss. oil well. TD 4,340 ft.

Cal-Standard 10 Grassy Island Lake, LSD 6, 11-35-7w4. Indicated Viking oil well. TD 2,864 ft.

Delhi-Banff 2 Acme, LSD 16, 23-29-25w4. D2 oil well. TD 7,022 ft.

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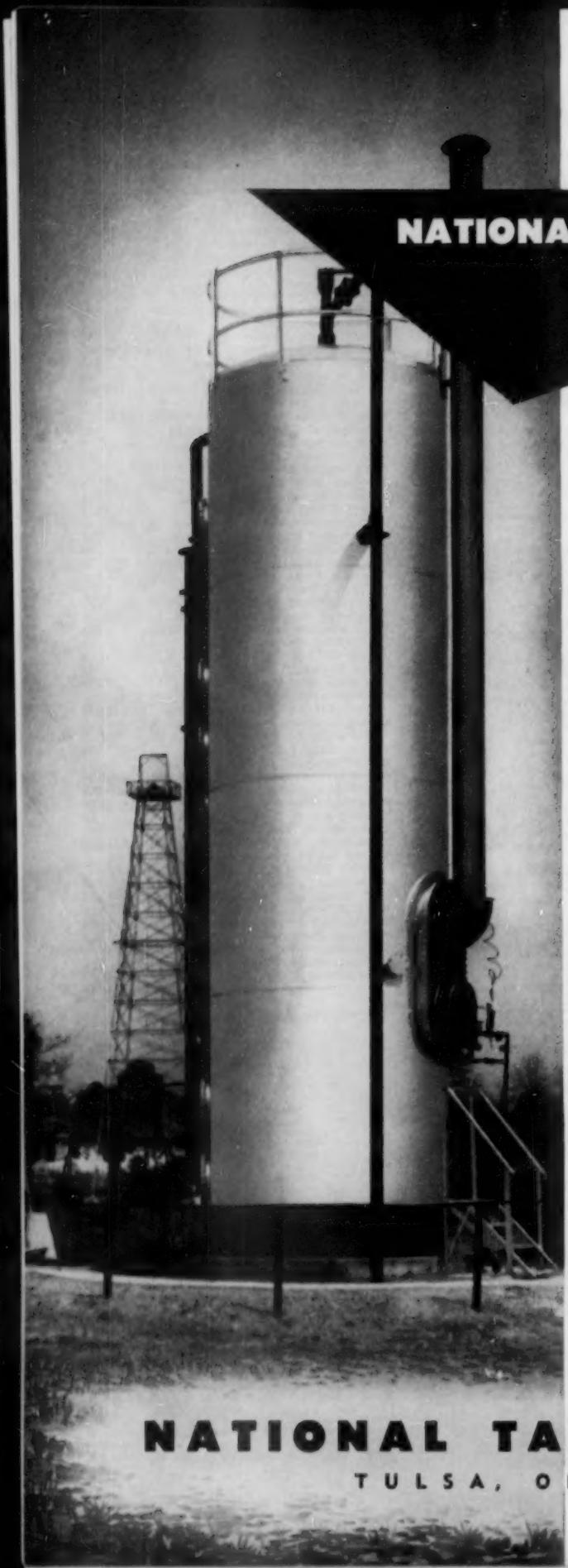
Youngstown Sheet and Tube Company Inside Back Cover

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington, D. C. Notice is hereby given that three parcels of land totaling 391.88 acres within the known geologic structure of the Lake Bisti-neau field, undefined, Bienville Parish, Louisiana, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 p.m., E.S.T., January 12, 1955, when bids will be opened. Details of the lease offering, description of the lands, how and where to submit bids, and bid forms may be obtained from the Director, Bureau of Land Management, Washington 25, D. C., L. E. Hoffman, Minerals Officer.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that two parcels of land containing 280 acres within the known geologic structure of the Pine Mountain field, Natrona County, Wyoming, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 1:00 p.m., E.S.T., January 26, 1955, when bids will be opened. Details of the lease offering, description of the lands, how and where to submit bids, and bid forms, may be obtained from the Manager of the Land Office, Cheyenne, Wyoming, or from the Director, Bureau of Land Management, Washington 25, D. C. L. E. Hoffman, Minerals Officer.



NATIONAL ICP TREATER . . .

SAVES
$731.64 PER MONTH

Inter-Office Correspondence

To: [redacted] Date: April [redacted]

Subject: National ICP Treater
installed on our [redacted] Lease.

Dear Bud:

We thought you might be interested to know of the results obtained from the installation of the ICP Treater on our [redacted] Lease last September.

In figuring the amount of gas purchased for this lease, taking months comparable in weather conditions, six months before and six months after the installation, we find that in the preceding six months we bought gas in the amount of $1,298.99 and in the succeeding six months we purchased gas in the amount of $599.47 a total saving for six months of approximately $699.47 or $133.00 per month.

Before installing this Treater it was necessary that we clean ten tanks per month, losing approximately twenty barrels of oil each time. This would amount to 200 barrels per month or approximately $486.00 per month. This Treater has now been in service approximately eight months and we have not cleaned a single tank.

In addition to the gas and tank cleaning saving we also raised the gravity of the oil an average of 1°, which raised the price of the oil .02¢ per barrel. As this lease averaged 5,632 barrels of oil per month after installation of the Treater the amount gained on raising the gravity amounted to $112.64 per month.

We figure the total savings as follows:

$133.00 per month saving on gas.
$486.00 worth of oil saved each month.
$112.64 more per month for increased gravity.
$731.64 Total saving each month.

The first six months after installing this Treater we had saved $4,395.84. As the Treater cost $3,439.26, at the expiration of six months the Treater was paid for with $956.58 left over as profit.

Respectfully yours,

[redacted]

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NATIONAL TANK COMPANY

TULSA, OKLAHOMA

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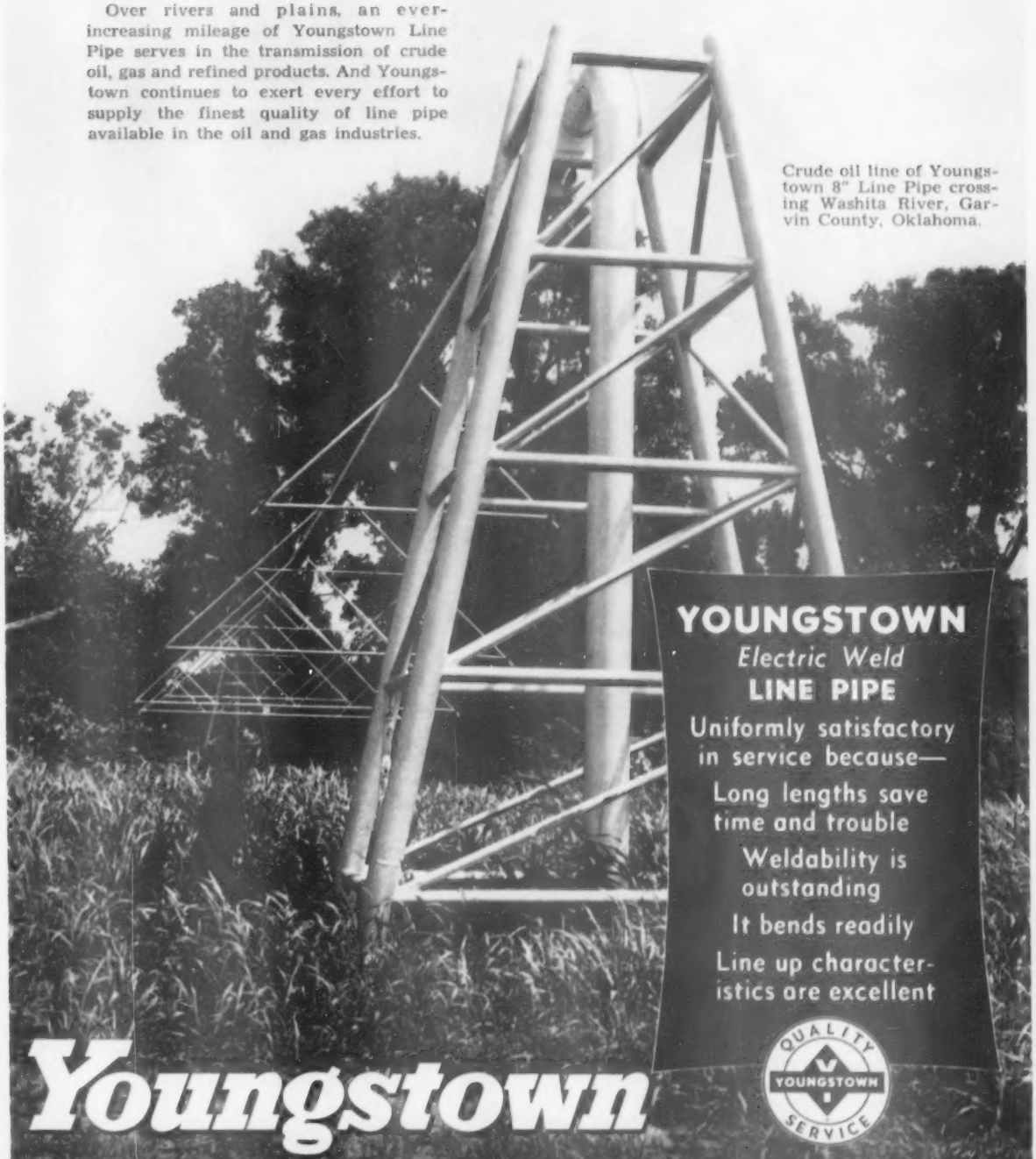

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Electric Weld
LINE PIPE

Uniformly satisfactory in service because—

Long lengths save time and trouble

Weldability is outstanding

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Line up characteristics are excellent

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Correct hydraulics are essential to obtaining the maximum economy and efficiency in your jet bit drilling operations. With the help of this *copyrighted* Hughes bulletin you can easily and accurately determine the pump capacities, power requirements, and type of drill stem that should produce the most hole per dollar invested.

The facts set forth in "Hydraulics in Rotary Drilling" have been compiled by Hughes engineers, working closely with the drilling industry and equipment manufacturers. Your Hughes representative will gladly furnish you with a copy. Another Hughes service.